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THE POST-OPERATIVE TREATMENT OF ABDOMINAL CASES.

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The ordinary case with an uncomplicated operation goes from the operating table in good condition. The less treatment the patient receives after laparotomy the better. There is a slight degree of depression, scarcely worth being called shock, which requires only that the surface of the body shall not become cold. The patient should be taken to a quiet, not too light room, and laid supine until the anesthetic depression has subsided. Then the head may be elevated. There will be some abdominal pain, some thirst, some nausea, and some insomnia the first night. These usually are of so little consequence as to require no treatment. As soon as the nausea has subsided, which should be by the day after the operation, the patient may be given fluids by mouth and the elevated head position should be instituted. The head may be elevated so that the trunk inclines at an angle 45 degrees above the horizontal. By the second day milk may be taken if all nausea has subsided. After this the diet may be steadily increased.

The *elevated-head position* may be maintained as much as the patient desires through the day. For sleep he should endeavor to lie supine with a pillow for the head. For maintaining the elevated-head position the head of the bed may be raised or an inclined plane placed behind the back. To prevent the patient from sliding down in bed a second inclined plane may be connected with the first. The second plane should accommodate itself to the thighs and legs the apex being at the knees. An exaggerated position is not called for. The elevation should be about 45 degrees above the horizontal. It need not be more than this. Raising the head of the bed 45 or 50 cm. (18 or 20 inches) on two chairs suffices. A pair of pillows below the buttocks may be fixed with a bandage to prevent the patient sliding downward.

The patient may be allowed out of bed in a chair on the eight or tenth day; at the end of two weeks he may be allowed to help himself out of bed; and in twenty-one days he may be permitted to go about his business. In the caes of wounds which have been drained, the patient should not be allowed to walk until the wound is entirely healed.

Special treatments are advocated by many surgeons. In some hospitals certain routine measures are followed in all cases. This is necessary only in such institutions as can not guarantee intelligent supervision over post-operative cases. In the presence of discriminating supervision, each case should receive the treatment indicated for that particular case.

The placing of a *rectal tube* after the patient has been put to bed gives comfort in many cases. It may be left in for two days. If it causes discomfort, some olive oil injected through it will sooth the bowel. The tube permits the escape of gas without muscular effort. It does no harm and may be of great benefit.

J. A. Sampson conceived the idea of *increasing abdominal pressure* by means of sand-bags placed on the abdomen. Sand-bags measuring 15 by 30 cm. and weighting 2 to 3 kilos (5 pounds) are used. These sand-bags are made flat and sewed through to keep their shape. Two bags are placed on the abdomen, one on either side of the median line, and held by the binder. The weight of the bags causes slight compression of the abdominal blood-vessels, distension of the intestine is counteracted, gas is caused to move onward toward the anus, and the patient has a sense of comfort and security. After the removal of large tumors or large amounts of fluid, this treatment is indicated.

The use of *morphin* after abdominal operations requires discrimination. If a patient is not going to have pain or shock, it is not necessary. It may be given as a routine in doses of 0.005 gm. (1/12 grain) every three hours while the patient is awake during the first two days. As a rule the patient is better off without it; but as a rule morphin will do less harm than pain, restlessness, and sleeplessness.

It is not necessary that most patients should have a *bowel movement* on the second or third day, after the operation. Usually if left alone the bowels will move by the fourth day. If the patient is doing well, there is no harm if the bowels do not

move till the fifth or sixth day. A dose of paraffin oil may be given if necessary. A particularly effective cathartic at this juncture is a dose of 45 c. c. (1½ ounces) of castor oil and 4 c. c. (1 dram) of compound tincture of cardamon.

The post-operative administration of *oxygen,* begun immediately, hastens recovery from ether and diminishes the liability to vomiting. The inhalation of the fumes from vinegar relieves the ether nausea.

Post-operative complications, requiring treatment, arise in many cases. They may be mild or so severe as to threaten life. None of the measures, described below are needed in the ordinary uncomplicated case.

Vomiting and nausea have an intimate relation to the anesthetic. It is possible to employ anesthesia that will not cause vomiting. Taking fluids too early into the stomach should be guarded against. Vomiting is easily excited after ether anesthesia. Commonly it is due to the reflex or direct mechanical disturbances incident to the operation. Vomiting is least apt to occur if the minimum of damage has been done to the bowel during the operation. If the vomiting is anticipated in a patient who has had ether, it may be prevented by passing the stomach tube before the patient regains consciousness and washing out the stomach. This may be repeated if nausea develops.

Nausea due to abnormal peristalsis may be serious. By placing the patient in the elevated-head position, downward drainage may be established. An evacuation of the bowels, secured by enema, will often stop the nausea. When vomiting of the contents of the small intestine is troublesome, lavage of the stomach is essential. This should be repeated as many times daily as necessary.

The surgeon should assure himself that there is no intra-abdominal condition which should be relieved. Gauze or other drainage material may cause irritation to the bowel and reflex vomiting; or it may be responsible for actual mechanical obstruction. A collection of pus may have been overlooked. Very commonly persistent vomiting is due to a spreading peritonitis, and will not subside except by direct treatment of that condition. Vomiting which is intractable is usually due to peritonitis or intestinal obstruction, and the surgeon should address his attentions to these conditions rather than to the stomach.

It is rarely worth while attempting internal medication for nausea. Counterirritation of the skin of the epigastrium by mustard is of help in some nervous cases. Fresh cool air admitted to the lungs, or the inhalation of oxygen, sometimes give relief. Gastric lavage should always be regarded as the main reliance of treatment.

Meteorism or gaseous inflation of localized segments of bowel should be prevented by the precautions already described. Minimize the damage to the peritoneum and bowel. Pre-operative purgation is a common cause. Hot water by mouth in 4 c. c. (1-dram) doses, as hot as the patient can bear it, will bring up gas. By elevating the upper part of the trunk, placing the patient in the semi-upright position the expulsion of gas is facilitated. The relaxed abdominal muscles may be caused to contract and press out the gas by applying heat. This may be in the form of hot stupes, or dry heat. The latter may be applied by means of the hot-air box.

A distended large intestine requires relief by an enema and the restoration of peristalsis. If the ordinary enema of soap and water does not accomplish it, a more stimulating one should be used. Turpentine, 4 c. c. (1 dram) to 500 c. c. (1 pint) of water, may be added. Powdered alum in the same amount may be used. A combination much employed is made of magnesium sulphate, 30 gm. (1 ounce); glycerin, 30 c. c. (1 ounce); turpentine, 4 c. c. (1 dram); and water, enough to make 120 c. c. (4 ounces). J. C. Munro recommended a mixture of 500 c. c. (1 pint) of milk, 500 c. c. (1 pint) of molasses, and 15 c. c. (½ ounce) of turpentine. A tube may be passed occasionally to assist the expulsion of gas.

For meteorism, the alum enema is most effective. The important thing is that gas shall be expelled. When the measures for the treatment of meteorism and vomiting fail to give relief in twelve hours, the surgeon should realize the strong probability of spreading peritonitis or obstruction being the cause of the trouble.

Eserin salicylate in doses of 0.001 to 0.0015 gm. (1/60 to 1/40 grain) is useful in some cases. It acts only on the small intestine and an enema should be given four hours later to empty the large bowel. Hormonal in doses of 15 to 20 c. c. (4 to 5 drams) is perhaps still more effective, as it acts on the whole intestine. Neither of these should be given in well-developed peritonitis or obstruction.

Nothing so effectively stimulates peristalsis as food. It should be given as soon as the stomach will tolerate it. It will be found to be the best gas eliminant.

Acute dilatation of the stomach may be prevented, diagnosed and cured by the stomach tube.

Pain following operation usually subsides with the meteorism. During the first night it may be so severe as to justify an injection of morphin. The drug is best not to be repeated.

Shock in a slight degree needs only the ordinary post-operative care of the patient. Its degree can not always be predicted, and it is a wise rule to be prepared for it in all cases. Its treatment in abdominal cases it not much different from that in other cases. *Proctoclysis,* the slow instillation of warm glucose or salt solution into the rectum, is of special service in shock of abdominal origin. If the patient can take water by mouth it is better so given.

Some surgeons combat shock by filling the peritoneal cavity with warm saline solution. This is best done by placing a soft catheter behind the omentum, or through it if preferred, so that its tip lies above the transverse mesocolon. The peritoneum and transversalis fascia are snugly closed about the catheter. Saline solution at a temperature of 45° C. (112° to 114° F.), is then allowed to run in from a height of about 1 meter. Five hundred or 1,000 c. c. (1 or 2 pints) will fill the abdomen. The tube is then withdrawn and the closure of the wound completed. This treatment gives heat and pressure to the region of the hypogastric and solar plexuses, and vasoconstriction results.

A routine practice of some surgeons is a method advocated by Clarke for filling the large bowel with saline solution. At the conclusion of the operation, while the abdomen is being closed, the patient is placed in the lowered-head position, 1 to 2 liters (1 or 2 quarts) of warm saline solution are allowed to run into the rectum. This flued passes through the whole large intestine. Clarke employs this method after the treatment of peritoneal adhesions, before closing the abdomen, and is able to see the fluid pass as far as the cecum and sometimes into ileum, and the colon drop back into its normal position by the weight of the water. If the patient is carefully handled, and the pelvis kept slightly elevated, the fluid is retained, and absorbed. The value of this treatment is very doubtful.

Heat applied to the abdominal wall, has the effect to increase salutary hyperemia and peristalsis. A. Strempel advocated heat by means of the hot-air box or the incandescent electric-light box—500 candle-power. It is claimed that it counteracts the tendency to shock, promotes peristalsis, diminishes adhesions, and inhibits peritonitis. A dry air temperature of 130° C. (265° F.) may be used for fifteen or twenty minutes twice daily. A temperature of not more than 55° C. (131° F.) may be used for one or two hours at a time, with intervals of three hours, day and night. Other surgeons use it only once or twice a day. Without any other post-operative treatment it is found that flatus is usually passed during the first twenty-four hours.

Thirst, after laparotomy, is sometimes distressing. If the patient is not nauseated he may drink freely of water that is not cold. If the patient is still nauseated, thirst can not be slacked with drink. Ice may be taken into the mouth, or the mouth rinsed with a cooling taste of lemon juice. The treatment of thirst consists in supplying fluids to the tissues; and this is done by proctoclysis, hypodermoclysis, infusion, or the other means described for restoring body fluids. It is not wise to give a vomiting patient fluids which do not quench the thirst and which do aggravate the vomiting. It should be remembered that water is not absorbed, by the mouth, stomach, or even the upper part of the intestine.

Retention of urine should not be confused with scantiness of urine. After the laparotomy the secretion of urine is diminished. If the patient is kept dry about 360 c. c. (12 ounces) are passed the first twenty-four hours. This should be increased by the use of water by mouth and salt solution to at least 500 c. c. (1 pint). If urine is not voided in the first eighteen hours, some artificial encouragement should be given, such as a warm enema or hot application to the pudendal and pubic regions. If these fail, and the patient feels that urine could be passed in the sitting or standing position, it may be tried. With a firm adhesive strapping to support the wound the patient can do it no harm by standing up to urinate.

The passage of small quantities frequently means injury to the bladder, or in indicates the overflow from a full bladder which should be catheterized. Catheterization otherwise should be reserved as a last resort. A record of the amount of urine voided should be kept. The catheter should be passed carefully. For lubricating the catheter a safe mixture is 25 per cent. argyrol in glycerin.

Other complications which may arise require their own treatment. Post-operative hemorrhage, peritonitis, ileus, acute dilatation of the stomach and phlebitis, may require attention. Post-operative hiccough is to be combated by removal of the cause (usually peritoneal irritation) and by sedative measures.

Acidosis should be treated by sodium bicarbonate and the other alkalies by mouth, and in severe cases by rectum and intravenously.

Post-operative *pneumonia* should be treated by giving the patient fresh air. The shoulders should be slightly elevated, concentrated nourishment should be given, the surface of the body should be protected from chilling, and nothing should be permitted that depresses the heart. It is possible that some day these cases may be saved from a fatal termination by insufflation of the lungs with fresh air. Pneumonia is to be prevented, by sparing the patient from exposure to cold before, during, and after the operation; by careful anesthetization; by cleanliness of the mouth; by having the patient breath deeply as an exercise two or three times a day after the operation; and in the case of old people, by avoidance of the recumbent position.

Remarks—In general, most abdominal cases require no special treatment. It is best that the patient should not be pestered with attentions. A small dose of morphin the day of the operation and, if at all indicated, the night following the operation should make the patient comfortable. The character of the operation and the amount of traumatism that has been inflicted are the chief determining factors. The patient should be allowed to change his position as he will. The most comfortable position is the most restful. Catharsis before and after operation is to be avoided if possible.

The time for getting up after abdominal section must depend upon many conditions. A clean undrained abdominal wound is well united in ten days. The sutures may be removed on from the eight to the tenth day. Broad adhesive straps should support the wound and hold on the dressing. With such adhesive straps a comfortable patient may be allowed up in a chair any time from the seventh to the tenth day. No harm need be done by sitting up even earlier. Weak patients should remain in bed longer.

An average healthy patient may be permitted to walk two days after he begins to sit up. The adhesive straps which support the abdominal wound and prevent strain upon the union should be worn for a month. Care should be taken that the patient abstains from straining for two or three months.

Post-operative feeding must vary for each patient and the nature of the operation. In operations not involving opening the alimentary canal, water in small doses may be taken after twelve hours. On the day following operation fluid nourishment which is least prone to fermentation and putrefaction may be given. Whey, broth, strained soups, orange juice, grape juice, lemonade, peach juice, malted milk, albumin water, and glucose solution may be given in small doses. At the end of forty-eight hours, if no signs of peritonitis are present, milk may be added. A small glass of milk (120 c. c.) may be given every four hours during the third day after the operation, and this amount may be doubled on the next day. Milk may alternate with the other fluids. Solid food, such as cereals, dry bread and soft egg may be allowed on the fourth day, and if no complications develop, full diet may be permitted on the fifth day. All food should be in moderate amounts. It should be well chewed. And the patient should preferably eat what tastes good.

For *emergency feeding,* when the conditions are not normal, when the patient can not be given the above diet, and nourishment is necessary, other expedients must be employed. These are intravenous, subcutaneous and rectal nourishment.

THE SUCCESSFUL SECONDARY SUTURE OF ULNAR NERVE; A CASE OF TOXIC NEURITIS.

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Nelaton (1865) was probably the first to perform successful secondary suture of a completely divided nerve. The operation has since been duplicated hundreds of times, both with and without mechanical aids, depending upon the extent of nerve destruction. Scrutiny of case records appearing in available literature shows a satisfactory outcome in over seventy-five per cent. of instances.

While, theoretically, primary neurorrhaphy would seem most logical and should prove uniformly satisfactory, yet, practically, the operation is not always more successful in its ultimate results than secondary suture. Some remarkable instances are recorded in the older literature where complete restoration of physiological nerve function followed secondary neurorrhaphy; e. g., those of Busch, Holmes and Esmarch, after suture of the radial at three, five, and sixteen months; those of Hulke and Jessop, of the ulnar after four months, and nine years; those of Krausold, Tillaux and Langenbeck, of the median after two, four, and eight months; that of Brenner after ten years; another of Tillaux's after fourteen years; and that of Simon of the median and ulnar nerves after ten months. After the majority of these operations sensibility speedily returned, but the period required for restoration of motor function was much longer—the earliest sixteen days, the longest three years, the average being between nine months and one year.

A greater percentage of successful results from both primary and secondary neurorrhapy has been made possible by an increase in diagnostic acumen, improvement in operative technic, the perfection of mechanical aids, and a better understanding of the importance of aseptic methods. An unsuccessful outcome in nerve suture may accrue from one or more of the following factors: (a) failure to resect sufficient intraneural connective tissue in the proximal segment, (b) failure to control intraneural hemmorrhage, (c) too deeply inserted sutures in closing the nerve sheath, (d) the use of a section of vein or fascia in areas of pre-existing cicatricial tissue, (e) infection, (f) a nerve defect too extensive to permit of repair excepting by tissue transplantation.

In my opinion end-to-end suture with fine catgut is the method of choice, whether operation be undertaken primarily or secondarily, provided the nerve ends can be sufficiently freed to make immediate union possible. Great care should be exercised to prevent infection; and hemostasis must be perfect to insure a satisfactory outcome. Where the nerve defect is too extensive to permit of immediate suture, homo or autoplastic transplantation may be undertaken. I have had no experience with any of the mechanical devices recommended for facilitating nerve suture, although their utility is unquestioned and excellent results have been reported from such methods of procedure.

A girl, aged eleven years, came under my observation and was operated upon May 2, 1918. Six months previously, i. e., in December, 1917, while attempting to open a fruit jar the glass broke and a sharp fragment divided the flexor tendons and the ulnar nerve of her left hand. Primary operation performed by another surgeon was not entirely successful as the first two and about half of the third finger had been paralyzed since the accident. There was considerable contraction of the fingers, and the wrist was maintained in a flexed position.

A free incision was made and the tendons dissected from the ulnar nerve, some granulation and cicatrical tissue which had formed between the nerve ends being removed. The distal and proximal ends of the nerve were located, the latter being found adherent to one of the tendon sheaths. Whether it was sutured to the tendon during the original operation I do not know. The nerve ends were dissected free for some distance to secure healthy tissue, and end-to-end suture then performed with No. 1 plain catgut. A flap of fat was obtained from the abdomen with which the anastomotic area was enveloped to prevent future adhesion to the tendon sheath which had been liberated.

An interesting feature to me, although my experience in this particular line of work has been limited, was that the next day some motion was noted in the first two fingers, sensation not appearing until three weeks later. I believe this is contrary to the rule in such cases. The operation was performed six months ago, and both sensation and motion are now perfectly restored.

The after-treatment consisted in the application of heat, light massage and passive motion after the wound had healed, followed by gradually increasing active movement to stretch the flexor tendons and develop the atrophied muscles.

Nerve suture, if performed immediately after receipt of the wound, says Pitres, is a logical operation, because by obviating separation of the wound lips and exuberant production of connective tissue it facilitates the passage of young fibrils of the central end toward the peripheral end of the nerve; but however easily and thoroughly this operation may be performed, it does not prevent degeneration of the fibers of the peripheral segment. Late suture seldom gives favorable results, because it cannot be performed without causing profound disturbance in growth of the fibers which occurs at the extremity of the central end. *A fortiori* is resection of the central end contraindicated excepting in rare instances; it is seldom of use and generally harmful, because it destroys the histological process which has occured in the zone of growth of new axones. In view of the inevitable degeneration of the lower segment even when sutured immediately, the opinion that occasionally immediate and ultra-rapid functional return of a divided nerve occurs is ill-founded and rests on errors of interpretation. Among the observations which have been brought forward in its favor, there is not one which can bear searching criticism. (Pitres.)

Dejerine also thinks rapid recovery of motility occurring one or two days after suture of the nerve is absolutely incompatible with clinical, anatomical, and pathological experience. The author makes the positive statement that it has neither been observed after primary suture performed immediately after injury, nor in secondary suture performed at a later date. After nerve section the peripheral end of the nerve always degenerates throughout its whole extent. If rapid motor recovery does not exist from a histological point of view, how are we to interpret the so-called rapid recovery which has been clinically confirmed a day or two after nerve suture? When these cases are criticaliy investi-

gated they are always found to be inaccurate and to lack clinical precision. (Dejerine.)

According to the view of Keogh in divided or completely crushed nerves, suture performed directly after resection generally gives the best results. In complete anatomical section with separation of the two ends the lower extremity of the upper neuroma must be pared away, as it is formed by fibrous tissue which opposes the advance of axis-cylinders. Resection must be extended beyond the zone of indurated tissue, but excessive shortening of the central end would necessitate pulling the nerve to allow suturing, or require application of a nerve graft, which is not to be recommended. Resection is also necessary because the extremity of the central segment often shows torsion with horizontal arrangement of the fibers, which constitutes an impenetrable obstacle to the regenerating axis-cylinders. The upper portion of the lower pseudaneuroma likewise must be resected, since it is also composed of fibrous connective tissue. When the two extremities have been freshened they should be sutured end-to-end. The following is the method employed by Gosset; approximate the two extremities by catgut, then unite the neurilemmas by several fine silk sutures, taking care not to draw the two cut ends too tight, so as to faciltate the advance in a straight line of the axis-cylinders of the central end. (Nageotte.)

Any operation must be regarded as illogical, says Keogh, which involves any doubling over of one or other of the nerve segments, also bayonet suture, and especially grafting the central end to a healthy neighboring nerve, or the peripheral end to an adjacent mixed nerve. Where the interval between two nerve extremities is too wide to permit direct suture, the two ends may be joined by the interposition or grafting of a segment of another nerve. However, the results of nerve grafting which *a priori* appears to be a logical procedure cannot yet be appreciated since regeneration is fraught with difficulties and takes place slowly. Sicard has suggested neuro-vascular auto-grafting by transplanting the segment of a neighboring nerve, preserving a large pedicle of vascular and connective tissue. This procedure would seem applicable where there was a healthy sensory nerve in the neighborhood. (Keogh.)

Dumas has performed a considerable number of nerve sutures and a larger number of "freeings." He found recovery of movement did not occur until late, but the point which impressed him most was that there existed a definite individuality in the nerves from the point of view of the rapidity and completeness with which they regained their motor power. The musculo-spiral regenerates readily, and the ulnar slowly; while the great sciatic (especially the internal popliteal) and the median give the most disappointing results.

Tinel has compiled statistics covering one hundred and eight cases of suture or nerve grafting, and shows only twelve to fifteen per cent of failures.

Gosset has reported one hundred and twenty-six cases of nerve suture of which twenty-five were performed by means of nerve grafting. The results appear to him encouraging, and he ascribes the failure of suture "to the fact that nerve resections have been too restricted, and that the suture had involved sclerosed portions of the nerve and for this reason was doomed to almost certain failure."

One hundred and fifty operated cases are cited in statistics presented by Keogh, who concludes:

(1) That exploratory incisions carefully performed under aseptic conditions are not harmful to injured nerves:

(2) That freeings do no harm and may favor recovery:

(3) That hersage of neuromata does no harm:

(4 That sutures for complete section of nerves performed six to eight months after injury often results in cure in the musculo-spiral and external popliteal:

(5) That resection followed by suture in severe lesions of the same nerves gives equally good results when the operation has not been too long postponed—eight months at the very utmost after injury:

(6) That sutures or resections followed by sutures of the ulnar nerve regenerates far less quickly and are altogether less satisfactory; those of the great sciatic and the median also regenerate extremely slowly; frequently twelve to eighteen months after operation there is no return of nervous function, or only a slight degree of recovery.

Instances of toxic (or autotoxic) neuritis are observed with sufficient infrequency to make isolated case reports of some interest. The disorder seems to have been first described by Graves (1828), but credit is due more recent authors for the major portion of our present knowledge of the subject.

Toxic neuritis more often than otherwise develops as a complication or sequel of one of the various infectious diseases, e. g., diphtheria, influenza, typhoid fever, smallpox, scarlet fever, measles, pneumonia, pertussis, crysipelas, arthritis, malaria, etc. It is a not infrequent concomitant of all forms of septicemia,

and may be strictly autotoxic when occurring during the course of diabetes, tuberculosis, carcinoma, syphilis and Neisserian infection. The disorder is comparatively rare in young children, and almost unknown in advanced age.

The lower extremities are most frequently affected, and the case to be reported corresponds to the rule—the child being unable to walk or stand without assistance. I am aware of no other instance, however, where an individual has been the subject of repeated attacks of toxic neuritis, and in that respect the case appears unique.

A girl, aged ten years, was sent to Louisville by the family physician from the interior to Kentucky to consult an eye, ear, nose and throat specialist who had removed the child's tonsils three years previously. Finding no pathological condition about the nose, eye or throat, the specialist referred the patient to me under the impression that the case might be surgical, as the child was unable to stand or walk.

According to the history obtained this was the third attack of similar nature which the child had suffered, the intervals between attacks being about twelve months. While I am unfamiliar with the previous history, the mother stated the child was unable to walk on two previous occasions, and that was true in the present instance.

This girl presented a rather peculiar and unusual clinical picture. She had hypersthesia of the lower extremities, with loss of all the reflexes; pupils and pupillary reaction normal; she had complained of no acute pain at any time; for two weeks she could not speak above a whisper. She developed an extreme degree of weakness of the lower extremities without definite evidence of paralysis. Radiographic examination of her spine and pelvis was made, because she had consulted an osteopath who stated that she had a "dislocated vertebra," but nothing abnormal was shown by the plate. The Wassermann blood reaction was negative. The feces and urine were examined and nothing abnormal found. Analysis of the blood showed sixty per cent. hemoglobin, otherwise it was practically normal. There was also considerable tenderness on pressure over the peroneal and tibial nerves. There had been no elevation of temperature, and barring her inability to walk the child was apparently well.

The present attack followed measles, but the history of the inception of the two previous attacks is not very clear. However, the mother stated the child had scarlet fever and influenza one and two years ago respectively and was thereafter unable to walk for several weeks Dr. C. W. Dowden, who saw the patient with me in consultation and was instrumental in having the laboratory investigations made, concluded that she had toxic neuritis in which I concurred although the history was somewhat obscure. Another gentleman who also saw the patient suggested that the manifestations might be due to hysteria. I always hesitate about making a positive diagnosis of hysteria under any circumstances because disasterous results have sometimes followed such conclusions.

Obviously no surgical treatment was indicated in this case, and while there may be some uncertainty about the cause of the disability, recovery having followed expectant treatment on two previous occasions, the prognosis seems favorable. I recommended that the child be given a tonic of iron, arsenic and strychnia—thorough elimination, hot baths and massage. The patient has now been under observation ten days, and while motion of the lower extremities seems somewhat improved, she is still unable to stand or walk.

According to Martin, the most common form of neuritis is a simple inflammation of a nerve or set of nerves, localized, and its cause can usually be traced to one or more of several factors, viz.: cold, traumatism, sepsis, occupation, cachexia, or from extension of an inflammation from an adjacent part, such as caries of a tooth, etc. The acute stage shows inflammation with redness and infiltration of the surrounding tissues. The inflammation may be interstitial with an accumulation of lymphoid elements between the nerve bundles. In this type the inflammatory process extends into the deeper parts of the nerve. The usual form is the perineural. In the parenchymatous type changes occur similar to those noted in secondary or Wallerian degeneration, the nerve fiber being separated from the cell body of the neurone to which it belongs. The pathology, according to this author, is that "the myelin becomes segmented and divides into small globules and granules, and the axis-cylinders become granular, broken, subdivided and finally disappear. The nuclei of the sheath of Schwann proliferate, and ultimately the fibers are reduced to a state of atrophic tubes without a trace of normal tissue or structure." This atrophy extends to the muscle supplied by the nerve, producing marked changes in the interstitial muscular tissues, in some cases only local in character. Electrotherapeutic methods of treatment are advised by Martin in the treatment of the various types of neuritis. "In every case no effort must be spared to eliminate toxins, and in this connection a milk diet is of special assistance; weakly convalescents

ought to be especially guarded against fatigue, excitement, or mental depression." (Perrin.)

The following interesting data are abstracted from Dercum's classical paper on neuritis published several years ago: The development may be gradual or rapid; it may or may not be attended by fever; it may involve the nerves of both legs, of both arms, of all four extremities, of the trunk, and of the head and face. Sometimes the motor fibers are especially attacked, and in such cases paralysis is the most prominent symptom; at other times the sensory fibers are especially attacked, and in such cases pain is the most prominent symptom. Again, both motor and sensory fibers are attacked, and in such cases both paralysis and pain are present. All varieties of mixed motor and sensory involvement may be noted: thus motor and sensory phenomena may exist in about equal proportion, or motor phenomena on the one hand or sensory phenomena on the other may predominate to a lesser or greater degree. The motor disturbance, instead of consisting of muscular paralysis or weakness, may consist of inco-ordination, and this symptom may resemble that observed in tabes. Involvement may be diffused or limited in extent; usually corresponding or homologous parts are involved, but this is not always true. Various sensory disturbances may be noted, such as numbness, paresthesia, tingling, pricking, hyperesthesia, hypesthesia, or anesthesia; also various trophic disturbances, such as atrophy of muscles, changes of electrical reaction, contractures, glossiness of the skin, lividity of the skin, edema, local sweating, arrest of growth in the nails, rarely ulceration; the tendon reflexes are usually lost early; the skin reflexes may persist, may be exaggerated, or may be lost. The attack commonly begins slowly and without fever; the nerves of the lower extremities are attacked by preference. The first symptoms noted are usually paresthesias, such as tingling, pricking, numbness in the legs and feet; after a lapse of a variable period of time diminution of muscular power in the legs is noted; pain becomes more pronounced and weakness slowly progresses; soon walking becomes difficult.

The various infectious diseases give rise to widely diffused neurites, both motor and sensory; these may be noted in the postfebrile period of typhoid fever and of other exanthemata, such as measles. Influenza may give rise to neuritis widely diffused and largely sensory; diphtheria may give rise to a motor neuritis characterized, as is well known, by an involvement of the soft palate, at other times by a widely diffused involvement giving rise to diphtheritic ataxia; septicemia may give rise to a neuritis widely diffused or more or less localized according to the special etiology, and which is both motor and sensory. Tuberculous neuritis, which is rare, is sensory in type. Malarial neuritis, which is also rare, involves the legs most frequently.

In the treatment rest in bed is imperative. The limbs should be so placed as to be neither excessively flexed nor unduly extended, and should be supported upon soft pillows, or better still, if they be very painful, upon cotton-batting kept in position by flannel bandages or by splints; in other cases flannel bandages alone, if not too firmly applied, give considerable comfort. Drugs for relief of pain should be used with extreme caution. In clearly toxic cases the free administration of diaphoretics is indicated for their eliminative effect. The ingestion of large amounts of water also favor free diuresis and may be decidedly beneficial. Aspirin and the various salicylates may be given with advantage in the earlier stages. In cases of average severity weakness of the extremities, pain and hyperesthesia may persist for weeks or months, and during this period mercuric chloride or potassium iodide will be found of benefit. Where loss of weight is marked and anemia develops, iron, cod-liver oil, malt and other nutrients are indicated.

The principles of the rest cure should be applied as far as may be possible—full feeding should be resorted to, milk and eggs in increasing quantities; and as pain and hyperesthesia subside massage should be employed. Later when nothing but muscular weakness remains, heat, massage and electricity should be used. The slowly interrupted faradic current is indicated in most cases, and the extensor muscles should receive especial attention. (Dercum.)

SYPHILIS AND OPERATIONS ON THE NASAL SINUSES.

In suppurative conditions of the nasal sinuses if there should be any question of the existence of syphilis, operative work must be undertaken with caution, since under antisyphilitic treatment many cases have been cured or have satisfactorily improved without operative interference. Many cases could be quoted to prove this. It may be said, therefore, that where there is a positive Wassermann reaction wait, if possible, until a course of specific treatment has either cured the sinus disease or made the necessity for operation clear.—BRYSON DELEVAN in *Proceedings of the American Laryngological Association.*

INDIVIDUAL ENUCLEATION OF MULTIPLE PELVIC TUMORS VERSUS THEIR MASS REMOVAL.

HUGH CROUSE, M. D., F. A. C. S.
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Large multiple fibroids, complicated or uncomplicated with ovarian or tube-ovarian cysts, present one of the most difficult of intrapelvic operative conditions. Frequently the retroperitoneum is utilized as the chief covering of the laterally and posteriorly located tumors. Such peritoneal misplacement produces a ureteral and sigmoidal displacement. The cohesive pressure between growing tumor, small bowel and caput coli incites adhesions between them, with consequent fixing and location of large and small bowel in an abnormal position. The vesicae fold of the peritoneum extends only too frequently over the anteriorly located tumors, bringing with it the bladder, and at times each of these—tumor and bladder—through intra-abdominal pressure become fixed to the anterior abdominal wall. When such adhesions exist an unfortunate entrance of the bladder is liable to occur while making the abdominal incision.

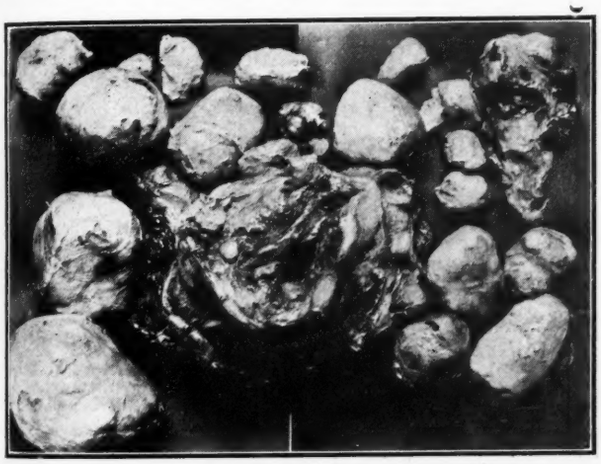

FIG. 1.

Case No. 1. Mary S.—aet 46. The central mass is the uterus redundant retro peritoneal coverings, and surrounded by the multiple fibroid tumors varying in size from small lemon to small ovetal head.

The usual method of operation upon this type of pelvic trouble, by slowly doubly ligating, cutting between such ligatures, then dragging the growth *en masse* to this or that side, constantly seeking and attempting to recognize the displaced ureters or bowel, results in an exceedingly slow operative procedure. Slow technic increases the amount of anesthetic used and overdraws on the patient's already lowered vitality.

To the experienced operator, upon opening an abdomen containing multiple tumors, investigation indicates inoperability because of the necessary length of the operation and the resulting shock.

It is my opinion that such retroperitoneally covered tumors can be operated upon successfully by a system of individual tumor enucleation with sequential dealing with their erstwhile covering. This surgical deduction is based upon my observation that practically all multiple fibroid tumors have an area of obliterated blood supply at some one point, due to the intracapsular tumor pressure; that this area of blood supply obliteration is always at the point of greatest tumor protusion. Further, that the lateral and posterior areas of fibroid tumor coverings alone seemingly contain the active blood supply. Next, that all such tumors, as well as ovarian cysts, have a line of cleavage area of their peritoneal covering, which line of cleavage when sought, found, and utilized will permit the rapid enucleation of the individual tumor from its peritoneal covering without the latter's simultaneous removal. The remaining sagging sac of peritoneal covering can be easily removed or infolded, after the individual growths proper have been eliminated, without injury to the misplaced structures vital to the patient, such as the ureters, small and large bowel.

FIG. 2.

Case No. 2 Molly H.—aet 45. The central large mass is the uterus with fibroids, the two large lateral tumers were tubo-ovarian cysts. The posterior large tumor was a very large cul de sac located tumor.

Three patients with multiple fibroids recently have presented themselves to the writer for surgical relief. All of them were bed fast, running toxic temperatures. Each had a very low vitality reserve and, upon thorough study, appeared exceedingly poor surgical risks. To relieve, yet not to lose the patient while upon the table, the following surgical plan, subsequent to the deductions previously made, was adopted.

A long abdominal incision was decided upon with a high primary opening of the peritoneum for investigation as to the existence of anterior wall adhesions. It was further decided to utilize the obliterated blood supply space, or the greatest pro-

tusion point area of capsular covering for the tumors, for the entrance to the tumor proper and their enucleation, without dealing at the same time with the sagging peritoneal covering. The next step of the procedure was to be the removal of this covering structure and the uterus by the usual hysterectomy technic of clamp, excision, then ligature.

The cases were each given careful pre-operative preparation. In each instance the planned long incision of the abdominal wall, with high primary peritoneal opening, was carried out, and in each adhesions were found between tumor, bladder and abdominal wall. The most superficially located tumors were first selected, their obliterated blood supply area was searched for, found, then incised and the tumors individually enucleated by means

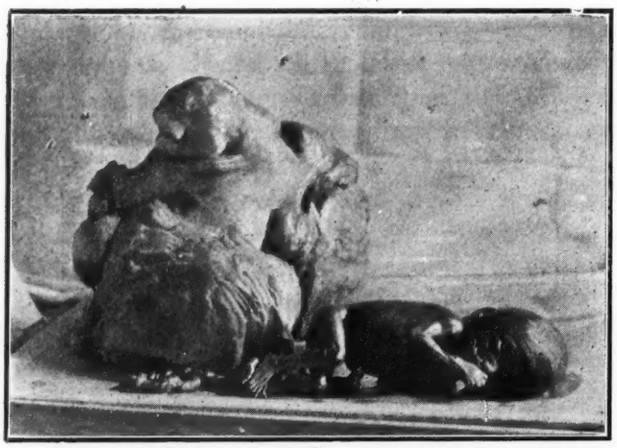

FIG. 3.
Collegues Case. Mass Removal.

of hooking them out from their covering through the medium of the finger, aided by blunt-pointed bone elevators. Consequent rapid diminution of the mass occurred.

From one patient twenty-two fibroids, varying in size from a small orange to that of a full term fetal head, were first individually removed, then the remaining uterine structure with its attached flabby erstwhile tumor coverings could be easily dragged into the abdominal wound. Clamps were then applied to the then readily identified and segregated broad ligament and uterine neck. The usual technic of abdominal hysterectomy was easily carried out. As a result of the procedure adopted, the bladder was uninjured, the ureters were readily identified and at no time were in danger of ligation, the retroperitoneal adherent bowel, large and small, were observed, not denuded or disturbed.

The operations were rapidly performed, a very small amount of blood was lost with consequent conservation of the patient's vitality. The lowered operative risk of this technic, when compared with the usual surgical procedure in such type of tumor operations, indicates its adoption whenever it can be utilized. There are some multiple pelvic tumors, of course, for which it will not be needed—those types which have not a marked retroperitoneal extension covering.

The accompanying groups of photographs show the tumors removed from two of my patients and one of a colleague's. The latter presents the multiple fibroid mass, plus a protruding fetus of about four months. In the colleague's patient the bladder was entered in opening the abdomen, due to pressure adhesions between the bladder and tumor and the anterior abdominal wall. My colleague had used the usual procedure pursued in removing tumors and uterus *en masse*, with the consequent long prolonged operative result and unfortunate entrance into the bladder.

The briefer time, the lesser quantity of anesthetic required and the consequent diminished shock, as well as overcoming a probable inoperable condition, are the chief reasons for the adoption of this technic in meeting the problem of the multiple fibroid tumor.

FEWER PHYSICAL DEFECTS, GREATER PHYSICAL POWER.

Courage, fortitude, loyalty and self-denial strengthen and ennoble. They are the virtues of calm weather, more eminently of days of storm and stress. War permits no flights from responsibility. Every obligation becomes more binding, both in relation to the personal life and the good of the whole—the community or state. It may seem a paradox that in time of war when life appears to be held most cheap, life and health come to be thought of as most valuable. The reason is plain. Physical vigor, physical endurance, physical power begin to have an increasing value in the minds of men. Man—the physical man—counts and men begin to make the most of men. The attitude toward man is the same as that toward the newest kind of rifle or the latest type of cannon. What is the best kind and what characteristics are most useful. Even with our brief experience, we have awakened to the nation's need for men with fewer physical defects and greater physical power. The nation is beginning to see that if there had been more interest in public health in time of peace there would be now less need for long months of training for endurance of necessary hardships incident to camp life.—***Quarterly Bulletin, Louisiana State Board of Health.***

MINOR INJURIES: PHYSICAL CONDITIONS WHICH INFLUENCE HEALING.*

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In my personal work the great predominance of minor injuries and their results, and the fact that I have never heard a paper or discussion on the best method of handling them, or the physical condition of the individual which has a bearing on the healing of such injuries, suggested the following commentaries.

The fact that the more serious affections are nearly always the subject of surgical papers, has caused me to wonder whether any of us really devote sufficient thought and attention to minor injuries, and particularly the physical conditions bearing on them, to prevent the development of serious complications and sequelæ. For instance, when an individual appears with a small cut, scratch or bruise on the hand or elsewhere, have we not been rather too prone to say: "Why, this is nothing but a mere scratch, just apply a bandage and it will be all right shortly,"—and then pay no further attention to the matter until several days later when the patient probably returns with a decided infection implicating tissues which under proper treatment would not have become involved? This attitude on the part of the medical profession has so long prevailed that the laity has naturally come to believe it is not worth while to consult the doctor unless infection has already supervened; and some of the patients I have seen were in serious condition when first observed. We should endeavor to educate the laity concerning the fallacy of this idea. In no other way can we hope to prevent infection and serious after-effects of minor injuries.

Having done considerable accident insurance and employers' liability work, I have been forcibly impressed with the economic loss, both to the employer and employe, from one simple factor, viz., neglect. This applies not only to the laboring classes, although most common with them, but to others whose knowledge should suggest that even minor injuries should not be neglected.

The abnormal fear of the medical profession, and especially of surgeons, inherent in the minds of the ignorant,—and fostered I am sorry to say by some of the better educated but prejudiced classes,—is an important factor in the matter of neglect. The practice of self-treatment by the ignorant or the friendly assistance of someone not qualified to treat the injury, and particularly the extraction of foreign bodies from the cornea or the conjunctival sac, is especially pernicious and dangerous; likewise the home treatment of cuts, abrasions, burns, etc., is fraught with dire possibilities for evil. In talking with a prominent opthalmologist quite recently, he deprecated "Tom, Dick and Harry" trying to remove foreign bodies from the eye, because of the disastrous results he had seen from such attempts; yet we know this is a very common practice. Everyone seems imbued with the idea that it is easy to extract something from the eye of another without the infliction of injury to the ocular apparatus while so doing.

A most serious factor is the insanitary surroundings at places of labor and also in the average home. Much of the danger here consists in secondary infection, the surroundings in which the patient works or lives being such that the keeping of the wound aseptic is an utter impossibility. It must be remembered that dust-carrying bacteria may easily sift through ordinary dressings, and that the same is true of liquids, such as tannery solutions, oils, etc., where the parts necessarily become saturated with such preparations; even perspiration may "wash" infectious material into the wound where the surrounding parts are dirty.

From my personal experience, the next most common contributing factor to unfavorable results in the treatment of minor injuries is the general condition of the patient, i. e., whether he is healthy, naturally a so-called weakling, or suffering from devitalizing constitutional disease. The healing of any major or minor injury may be retarded by the presence of disease. I have often seen marked delay in the repair of minor wounds and injuries from this cause, and the general condition of the patient had to be improved by appropriate treatment before the local injury exhibited any inclination to heal. The majority of such patients either do not realize that they are diseased, or knowingly try to mislead the physician, hoping thereby to keep him in ignorance of their affliction. I have found this factor so prevalent that where a wound does not heal properly or promptly, I know have a urinalysis made, blood pressure taken, blood count made, the sputum examined, and other necessary investigations instituted, and by these means the answer to the question is always obtained.

Syphilis is the most frequent devitalizing disease noted, but readily responds to anti-syphilitic treatment, and healing of the local lesion then rapidly

*Read before the Louisville Society of Physicians and Surgeons, September 19, 1918.

occurs. This has appeared especially true in the poorest laboring classes. Nephritis and diabetes have been frequently encountered and treatment has been annoying and difficult. Alcoholism is found quite commonly, particularly in those of low intelligence, and this may tend to delay healing. Tuberculosis, like nephritis, diabetes and other wasting diseases, retards the healing process. Varicose veins constitute a serious complication when present, which is not infrequently true in burns about the legs and feet.

As an illustration of the necessity of thoroughly examining every patient having a local injury I will briefly cite two cases:

CASE 1: A negro, male, aged eighteen years, a "strapping big fellow," had the skin and subcutaneous tissues literally ground from the top and outside of his right foot, but fortunately the tendons were not involved. The denuded surface was irregular in shape and about 3 by 5 inches in area. He was sent to the hospital where the wound was cleansed and properly trimmed. Healing seemed to progress normally for about a month, that is the surface granulated and the cicatrix appeared healthy.

When the wound had diminished to 1 by ¼ inches in area, it began to disintegrate and soon extended until it became 1 by 2 inches in size. The treatment was then changed from the application of balsam of Peru to calomel dressings,—after interrogating the patient as to syphilitic infection or the presence of sores on his body, which was vigorously denied.

When only a linear unhealed and unhealthy looking granulation remained the wound again disintegrated, and again the treatment was changed without appreciable good effect. The patient repeatedly denied the possibility of syphilis when questioned.

After having faithfully employed about everything usually recommended for local treatment in cases of this kind, I lost patience with the man and sent him to the laboratory for a Wassermann test to be made, which showed four-plus positive. He was then referred to the government clinic at the Louisville Public Hospital where healing of the local lesion promptly occurred under anti-syphilitic treatment.

It is my opinion that this patient was entirely innocent or ignorant of his luetic infection. I afterward treated his father for a small cut on his hand which required an unusually long time to heal. The father was not tested by the Wasserman method, as the company employing him refused to pay the expense and I could not get him to attend the government clinic. I believe the negro boy had inherited syphilis, as I could find no evidence of a scar on his body.

CASE 2: A male, aged fifty-nine, seemingly in good physical health, had a burn about the size of a silver dollar on the outside of his leg just above the ankle extending not quite through the skin. Healing progressed very slowly, and after a few days treatment the results not being satisfactory, urinalysis was made which showed that he was suffering from a kidney lesion. The patient was then referred to his family physician for treatment of the renal disease, but the burn healed slowly despite constant attention and all the assistance he could give. This patient was an intelligent man and anxious to get well.

These two cases are mentioned merely to illustrate that the local injury is not the only factor to be considered. The list of cases might be extended to include many other constitutional diseases, and pursuance of the subject naturally leads to the treatment not only of the primary injury but of the conditions bearing thereon.

It is not always possible to send the patient to the hospital; in fact, this can rarely be done because of the factor of expense. We must therefore look after the surroundings of injured patients and where necessary improve them by education. This may necessitate the employment of considerable tact on the part of the medical attendant, and it most frequently does. It is difficult to make some people understand that they do not have to eat the proverbial "peck of dirt," or be annoyed and exposed to disease-carrying flies, mosquitoes, cooties, etc., but the time has arrived when we must promulgate this line of education.

The necessity for conservation of labor in every line of endeavor demands that an injured person be absent from his work the shortest possible time, and it is only by looking after all the conditions surrounding the patient that we can preserve or increase the efficiency of the individual. Personal, factory and business-house sanitation, and facilities for immediate and properly administered treatment are all necessary, as well as the knowledge available as to the physical condition of the injured.

That this is a good business proposition the larger and most intelligently managed commercial concerns have appreciated, as witness the vast increase in the scope of industrial welfare work within the last two or three years.

HERNIA OF THE URINARY BLADDER.

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SELMA, ALA.

Owing to its proximity to the inguinal region, the urinary bladder, in part or whole, may present itself through any of the openings where hernias make their appearance; but bladder hernias more frequently are found as the direct inguinal variety. By the term hernia we imply the presence of an opening plus a sac with its contents and coverings. In many hernias of urinary bladder the sac is either incomplete or totally absent. Hernias belonging in the gynecological class as vaginal, etc., I shall not consider.

The bladder is a musculo-membranous, hollow viscus, whose principal function is the temporary storage of urine. Excepting the stomach, it is the largest hollow viscus in the human body, and both these organs are subject to marked variations of internal pressure. The bladder is contractable, also expansible and distensible beyond its normal capacity of about 500 C. C. It is suspended superiorly and inferiorly, being fairly, firmly fixed at its base. Its true and false ligaments are composed of fascia and peritoneum. The bladder is generally movable making it capable of being carried in part or wholly into any of the hernial openings.

Modern medical and surgical text books contain meager information concerning extrusion of portions of the urinary bladder as a possible complication in any types of hernias, despite the fact that the pathology was recognized and described early in the eleventh century. The comparative infrequency of the complication is certainly insufficient excuse for its apparent neglect by modern investigators. So far as can be ascertained less than 400 examples of hernias of the bladder have been recorded in the literature of the world. No doubt many more cases will be recorded in the future as the condition becomes better recognized. We can more readily recognize it largely because the fact that the Bassini technic permits more thorough exposure and higher ligation of the sacthan in other methods.

Most observers find a greater frequency of vesical hernias among males than among females in which finding I concur. Vesical hernias are more frequently found in the inguinal type of males and the femoral type of females. They are more frequently observed in adults for both sexes but there are exceptions to this rule, as they have been occasionally found in children of both sexes.

Anatomically there are recognized three types of vesical hernias: (A) The extraperitoneal, a portion of the viscus protrudes along side of the sac of an ordinary hernia; (B) The intraperitoneal, a portion of the viscus appears in the sac covered with peritoneum; (C) The para-peritoneal, a portion of the viscus is covered with peritoneum of the sac. In practically all instances in addition to a portion of the vesical walls the hernial sac contains omentum and intestines. True primary vesical hernias may be regarded as pathological curiosities.

The etiology of these hernias is largely the same as hernias in general. As the cause of this pathological lesion the following factors are of importance; namely, all conditions that tend to increase abdominal pressure, such as occupations that necessitate vigorous muscular efforts; physiological or pathological states which distend the abdominal cavity, stretching the abdominal parietes and widening the orifices normally present in its walls; diseases associated with frequent, repeated, increased, intra-abdominal pressure; conditions which weaken the abdominal walls, such as acute or chronic diseases, especially those causing great emaciation. Obesity or traumatism, such as abdominal operations followed by pathological adhesion of viscera or omentum to the anterior parietal peritoneal wall near a hernia opening may act as pre-disposing causes. Feeble development or atrophy of the aponeurosis of the transversalis muscle and of the conjoined tendon is a factor of great importance in direct inguinal hernia. Congenital, inherited, or acquired weaknesses of the abdominal walls reveal pre-existing hernial sacs of prenatal or post-natal formation. Any condition associated with prolonged over distention, over stretching, impaired contractibility, restricted mobility, etc., of the urinary bladder with congenital malformations of its walls or diseases of the lower urinary organs impairing the expulsive force of the bladder or hindering the outflow of urine may be considered as causes for this type of hernia.

As definite characteristic symptoms seldom occur, accurate anti-operative diagnosis of the vesical complication of hernia is usually impractical. It is suggested that the most constant indicative clinical sign is a hernial tumor which subsides after micturition. Pressure upon the swelling induces a desire to urinate or even cause

the expulsion of urine. According to the majority of observers there are no characteristic symptoms nor does the presence of the complication necessarily produce serious discomfort to the patient. In two cases that came under my observation, there was considerable pain with more or less regularity which formed the main symptom that caused the patients to seek relief. The hernial swelling may be cylindrical, ovoid, soft, elastic and fluctuating or hard and non-elastic. The size of the hernia, particularly when the urinary bladder is not complicated with other viscera may change rapidly, being influenced by the clinical type of hernia, the position of the body, the amount of urine present in the bladder together with the amount of bladder engaged in the extrusion.

The subjective and urinary disturbances are frequent and painful urination, pain at the end of difficult urination. Patients may have to resort to unusual positions or may compress the hernial protrusion in order to empty their bladder. The objective disturbances are increased swelling with accumulation of urine and a decrease with voiding. The injection of fluid or air into the bladder causes an increase of the size of the hernical swelling. A sound introduced into the bladder, may enter the herniated bladder process. A cystoscopic examination of the bladder may show the round contour of the bladder with the opening of the herniated bladder process.

Vesical hernias may exist alone, or with another organ or organs from the same side or from the opposite side of the body. This, however, is unusual, but did occur once in my experience. In only one instance under my observation, was the hernial sac, with its visceral contents large, the smaller ones appeared more painful. Frequently one notes the excessive breadth of the hernial canal and the large hernial ring. The spermatic cord may be to the outer side of the hernial swelling, or spread out over, behind, below or external to it, although it may be found upon the anterior and outer surface of the bladder. The sac may be thin or thick, congested and infiltrated, closely adherent to the spermatic cord, and not uncommonly covered with a thick moss of fatty tissue. This I have observed once. An extra peritoneal bladder hernia has no serous covering, but a pseudo-sac, consisting of connective tissue overlies the herniated bladder process. The pre-vesical accumulation of fatty tissues is thought by many to be an important contributory etiological factor. The sac contents may be hernical fluid, a part of the uterus, ovary, omentum, small or large intestines, the caecum, or the appendix. The caecum and appendix I found in the hernical contents, together with a portion of the bladder, on the left side, in one instance.

The existence of hernia of the urinary bladder may be unrecognized, suspected, or diagnosed, before operation, or the diagnosis may be made at the operation, or indeed it may remain undiscovered until the autopsy. It is sometimes difficult during the operation to distinguish the true hernial sac from the tumor mass. This may be determined by passing a steel sound via urethra to the field of operation, thus bringing the trabeculated appearance of the bladder muscles in more prominent view. One may expect to find the bladder located nearer the median line than the true hernical sac.

An operator should always be on his guard when operating upon hernias lest he incise the bladder under belief that he is opening a hernial sac. In operating upon a recurring hernia, owing to the possible adhesions that may have been formed, he should always be on his guard and expect bladder complications. If isolation of the hernial sac, from the inner lower portion of the ring be difficult, the involvement of the bladder is to be suspected. One can avoid this injury by securing a good exposure of the operative field. The more exact the dissection of the sac, quite up to the artery, the more likely will cystocele, especially in its earlier stages, be discovered. Vesical hernias can be produced by traction upon the sac. Efforts to place the ligature higher up, may, if one be careless, result in catching up the bladder wall. Should the bladder be incised or otherwise injured during the operation, and the operator is not sure of the accident, a sound may be passed and brought out at the injured point. If this accident occurs, careful suture with non-absorbable material is necessary using care not to penetrate through the bladder walls, after which free drainage should always be provided. In these injuries, immediate closure of the bladder wound is of primary importance; even though its walls are not injured, it is safe to fortify the weakened spot by a few sutures.

Operators are not agreed as to the advisability of using a permanent catheter after bladder su-

ture, nor, if the catheter is used, how long it should be retained in the bladder. It is left in from one day to as long as two weeks. These points appear to be the extreme. Judgment should be used, based upon the extent of the injury, and I believe a medium between these two extremes would be wiser and more practical. Drainage extending to the bladder wound is a prudent provision against leakage from the sutured walls and should never be omitted.

Operations for the radical cure of vesical hernia have practically no mortality. What mortality occurs is usually due to complicating conditions, such as old age, great debility, shock, long standing strangulation, and unrecognized bladder injuries. When complicated in convalescence by urinary fistulae, they usually close spontaneously.

In conclusion I wish to speak briefly of three cases of bladder hernia that have come under my observation. The first is that of a negro male child five years of age, referred to me fifteen years ago by Dr. Sellers, then of Brown, Alabama, for a strangulated, indirect, left inguinal hernia. This proved to be most unusual and interesting, as the operation proved the existence of a transposition of the caecum and appendix from the right to the left side, both of which were found in the hernial sac together with a small pouch of the urinary bladder. The caput of the caecum was found gangrenous for an area about the size of a fifty cent piece. This was resected, and the appendix was removed. All the hernial contents were returned to the abdominal cavity and the wound closed, the patient had rather a stormy time but made a good recovery.

(Case 2) A. W. C., white, male, age 74, druggist by profession, had led a very active business life. He had a small, left, indirect inguinal hernia for some years. At the age of 71 had a severe attack of cerebral hemorrhage, paralysing his right side. About a year after this he decided to have his hernia operated. This was successfully done under local anesthesia (cocaine). A year later a direct inguinal hernia appeared on the right and paralyzed side. This was a small hernia, but was quite painful to him. He decided upon a second operation. On account of his then physical condition, members of his family and myself endeavored to dissuade him. He replied that he had rather be dead than live with the discomfort that he was then enduring. The operation was done under local anethesia (cocaine). An unusual amount of fat was noted, which aroused suspicion and was carefully divided upon the supposed sac, when a trabeculated surface was observed, this being pushed inward and the peritonum opened farther out, a hernia of the bladder was demonstrated. The usual closure was done. Patient died three weeks later from a chronic interstitial nephritis which was known to exist prior to the operation.

(Case 3) J. E. G. male, white, age 18 years. This patient had a left undecended testicle. No indication of a hernia, nor discomfort of any sort until sometime after he had joined a cavalry company in the summer of 1916 when the Mexican Border Army was being formed. Shortly after entering this service, he commenced to notice discomfort in the left inguinal region after drilling on horse back. In October 1916 he was visiting his home on a furlough. He consulted me, when a small direct left inguinal hernia was noted. Operation was advised, not accepted until November 15, 1916, the painful condition having grown steadily worse. At the operation when I thought I was opening a slightly thickened hernial sac, an excessive amount of clear fluid with a slight uriniferous odor escaped. There being some doubt as to whether a thin walled bladder had been opened or not, a catheter via urethra was passed, and brought out at the opening, definitely proving that the bladder had been opened. This incision closed with silk ligatures. The peritoneum was opened on the outside of the bladder and a search for the testicle was made, which was not found in the inguinal canal or in the abdominal cavity, this organ had either atrophied or had never developed. The peritoneum, muscles and fascia were closed, with a single drain extending well down to the bladder wound. Then followed some urinary leakage. This stopped spontaneously within a reasonable time. He joined his Command on the Texas border, and was honorably discharged from the Army. He followed the occupation of gas helper until the summer of 1917, when he again entered the Army, where he is now serving. There has not been a return of the hernial condition.

In case two and three here reported, no other viscus was found in the hernial protrusion at the time of the operation, except the urinary bladder. This fact may or may not account for the excessive pain complained of..

THE CONSERVATIVE TREATMENT OF OCULAR INJURIES.*

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The following three histories are presented briefly for the purpose of illustrating the favorable cosmetic and functional results which may sometimes be obtained by rational conservative methods of treatment of ocular injuries. In the management of such cases the decision for or against the advisability of immediate enucleation will depend to some extent upon the character of the missile by which the injury was inflicted. However, regardless of the nature of the offending instrument, where infection ensues, enucleation is usually imperatively demanded to preserve the integrity and function of the uninjured eye.

Wounds about the eye inflicted by bullets from small caliber firearms seem especially amenable to conservative treatment; at least such has been my experience. On the other hand, however, those due to particles of iron or steel almost invariably require treatment by more or less radical methods, otherwise the opposite eye becom s involved and the vision of both may be ultimately destroyed. Infection and sympathetic opthalmitis constitute the greatest impending dangers in all ocular injuries, and have always been the *bete noire* of the ophthalmic surgeon.

History 1. J. S., a male, aged twelve years, was shot with a 32 caliber rifle, June 13th, 1915, the bullet entering just below the right eye. He was sent to the Louisville Public Hospital, where I saw him about two hours after the injury. Examination showed that the bullet had ranged backward and upward, lodging in the posterior portion of the orbital cavity. No effort was made to remove the missile, nor was a probe introduced into the wound of entrance.

The patient was seen and examined during the next few days by several other ophthalmologists, and as the conditions seemed rather serious the majority of them recommended immediate enucleation of the injured eye. However, after due consideration I concluded to watch the patient carefully, to test his vision daily, and simply await further developments. In the event any definite indications developed for enucleation I was prepared to operate immediately. The boy had absolutely no vision in his right eye when admitted to the hospital. The external wound was kept open to insure free drainage, and no infection occurred. The wound healed from within outward during the succeeding two weeks.

The eyes were then fitted with glasses and the following vision obtained: R. E. 8/10, which is nearly normal: L. E. 10/10, which is absolutely normal. The patient now states that he can see equally well with both eyes; of course he still wears glasses and will probably have to continue doing so indefinitely.

In the majority of instances of this kind the eye is immediately enucleated, but by constantly watching the fundus for retinal changes indicating beginning sympathetic ophthalmitis the operation may be safely postponed. If such symptoms appear at any time, the injured eye may then be enucleated. So long as no symptoms develop I think it is better to retain the eye even though it may be without vision, than to enucleate and thus force upon the patient the necessity of wearing an artificial eye.

History 2. Mr. S., aged forty-five, was shot December 2nd, 1916, with an old-fashioned muzzle-loading 44 caliber pistol. The bullet entered just above the left eye, and ranging downward lodged behind the eyeball. Total blindness in that eye was immediately produced, vision being NIL when I first saw the patient a few hours after the accident. The missile followed the direction of the optic nerve, and evidently the nerve was damaged to a greater or less extent. There were indications of injury of the retina and choroid where the bullet struck the upper and posterior portion of the eyeball.

It was difficult to decide in this case whether or not immediate enucleation should be practiced, but I finally decided to observe the patient daily and await developments. The eye was closely watched and today it is practically normal in appearance. The man could not open the injured eye for about a month, and slight infection occurred from a wad which followed the bullet into the tissues and which had to be removed. I also extracted a small section of the bullet, which was divided into three pieces, but the major portion still remains in the tissues.

After opening and draining the track of the bullet, the eye was examined daily with the ophthalmoscope for retinal or fundal changes, and none being noted the eye was preserved. Had any symptoms of irritation developed the injured eye would have been enucleated immedi-

* Clinical Lecture delivered before the Louisville Medical Club, of Louisville, Kentucky.

ately. I regret to say this patient has very little vision in the injured eye, but am glad that it could be saved for cosmetic reasons. He has had no further trouble and says he now has slight vision in the left eye.

The lower portions of the retina and choroid escaped injury, but the upper and posterior parts were more or less damaged by the bullet. The patient had no perception of light at first, but after the wad and portion of the bullet had been extracted he could distinguish light from darkness and vision has slightly improved since. The *x*-ray plate shows the two larger pieces of the bullet still in the tissues.

The majority of operators probably would have attempted to remove the bullet immediately after the injury; but I believe it advisable to leave such foreign bodies alone so long as they produce no trouble. I have under observation several patients who have carried bullets in about the same situation as this for twenty years without the production of irritation or other symptoms. This is certainly better than to attempt removal of the bullet and thus subject the patient to the additional danger of infection. It is almost impossible to overcome infection in this situation without enucleation of the eye.

History 3. Mr. R. T., aged seventeen. This is not a gunshot wound, but the injury is similar to the others. Several specialists have seen this patient in consultation with me, and there is some question as to the exact cause for the persistent left-sided blindness which he exhibits.

The patient states that he was injured while exercising in a gymnasium, that he missed the "punching bag" and fell upon a sharp screw about three inches long and one-quarter inch in diameter which entered just below the left eyeball and ranged upward and backward. A probe could be introduced into the wound for at least one and one-half inches.

I saw the patient about an hour after the accident. Immediate ophthalmoscopic examination showed the left eye totally blind at that time. The pupil was widely dilated and irresponsive to light. The patient was treated along conservative lines and the eye was closely watched. The main question was whether to take the risk of leaving the eye, or whether to resort to immediate enucleation; but so long as there were no indications of irritation in the opposite eye, I concluded to postpone operation. The external wound was kept open for drainage and thus allowed to heal from behind forward.

The progress of the case was satisfactory, excepting for the complete ptosis of the upper lid for about three months. Under treatment with the high frequency electric current, massage etc., the muscle has been practically restored to its normal condition. The optic nerve was probably completely severed, although there developed no evidence of optic neuritis: the fundus of the eye at first appeared normal, but it was later noticed that the optic disc was getting pale. The real cause of his blindness, however, remains uncertain. While the boy has no vision in that eye, I succeeded in saving it, which is certainly preferable to an artificial eye. No roentgenoscopic examination was made, nor was there any necessity for it, as the instrument with which the injury was inflicted was immediately withdrawn.

The first and most important feature in the conservative treatment of injuries about the eye is the institution of adequate drainage; second, frequent ophthalmoscopic examination of the fundus of the other eye. Sympathetic ophthalmitis is always to be feared in cases of this kind, and the moment indicative symptoms appear the injured eye should be removed, otherwise the logical ultimate outcome will be blindness in both eyes. Experience has shown that in the majority of instances, if the injured eye be enucleated immediately upon the appearance of indicative evidence of irritation in the opposite eye, the latter may be preserved.

While serving as interne in one of the Chicago Hospitals we treated a large number of patients whose eyes had been injured by particles of steel, and in the majority of cases enucleation became imperative to preserve vision in the uninjured eye. Enucleation is especially indicated if the steel enters near the ciliary body, the chances being much greater for the supervention of sympathetic ophthalmitis if the eyeball is damaged near the ciliary region or the sclerocorneal junction. I believe in seventy-five per cent of patients under such circumstances enucleation will be necessary sooner or later if the steel remains in the eye.

The first sign of sympathetic ophthalmitis shown by the ophthalmoscope is a slight retinitis; the retina becomes congested, minute white specks are noted around it and also in the vitreous fluid, the patient complains of spots before the eye. The vision should be tested daily and so soon as any blurring or reduction is noticed, one should look for other evidences of sympathetic ophthalmitis. So long as indicative symptoms do

not appear, I think it is far better to do nothing excepting to institute adequate drainage, and combat infection should it supervene by facilitating free outflow from the wound and the use of suitable antiseptic irrigations.

A good working rule in ocular injuries may be stated as: when there are no signs of irritation present in the good eye, treat the injured eye conservatively or let it alone; from a cosmetic standpoint the natural eye, although it may be blind, presents a far more attractive appearance than an artificial eye. The moment indicative evidences of irritation or sympathetic ophthalmitis appear, enucleation of the injured eye becomes imperative to preserve the vision in the uninjured eye.

THE VALUE OF THE DICHLORAMIN-T SOLUTION (DAKIN-DUNHAM) IN THE TREATMENT OF INFECTIONS OF THE UPPER AIR PASSAGES.*

D. BRYSON DELAVAN, M.D.,

NEW YORK.

Dichloramin-T, the basis of the Dakin-Carrel fluid so extensively used as an antiseptic in a wide variety of infectious conditions, has an intense germicidal action corresponding to its high content of chlorin. It is difficult to find for it perfectly satisfactory solvents which will yield stable solutions. Drs. Dakin and Dunham state that the best medium thus far found in an oil obtained by the chlorination of paraffin wax, to which has been given the name "chlorcosane." Other solvents experimented with are a mixture of eucalyptol and paraffin oil, and a heavy oil obtained by the chlorination of eucalyptol. Eucalyptol has been found to be irritating. Chlorosane is not irritating and has seemed decidedly preferable. Explaining the action of dichloramin-T in oil, Dr. Dakin says that antiseptics incorporated with or dissolved in oily substances usually possess little if any antiseptic activity because intimate contact with the infected matter is hindered by the oil. When, however, the dichloramin-T solution in chlorosane are brought in contact with aqueous media the partition coefficient between the oil and the water is such that a certain amount of the dichloramin-T passes into the water and there exerts its germicidal action. The amount of the dichloramin-T thus passing from the oil is increased by the presence in the aqueous medium by substances capable of taking up chlorin. So that the oil solution seems as a store for the antiseptic which is drawn upon to maintain the germicidal activity of the aqueous medium with which it is in contact. The dichloramin-T oil solution may be sprayed upon wound surfaces or poured into accessible parts of deep wounds. It yields moderate amounts of the antiseptic to watery media, such as secretions from wounds or mucous membranes. It is suitable for sores requiring prolonged antiseptic treatment and for first dressings of wounds which do not require irrigation. The application of the oil is extremely simple, and generally it need not be renewed more than once in twenty-four hours.

Admitting the germicidal power of dichloramin-T, it is desirable to study its value in the disinfection of septic conditions of the upper air passages, regions especially liable to infection, prone to harbor germs of dangerous character, abounding in recesses difficult of access by the ordinary means of application, and often becoming foci of infection threatening extreme danger. This is especially true of the upper nasal region, the vault of the pharynx and the tonsils. The dichloramin-T may be used to advantage in these regions under three different conditions:

1. To prevent the extension of newly acquired infection.

2. To overcome the acute results of infections, and

3. To abolish the bacilli persisting in carriers.

The success of the method must depend upon the thoroughness of the application of the disinfectant. Brushing the surface of the tonsil or spraying the lower section of the nasal cavity cannot possibly be effective. A spray atomizer must be used which will carry thespray in all directions, upward, downward and sidewise.

The crypts of the tonsil must be disinfected to their lowest depths, and the superior half of the nasal cavities must be thoroughly reached. To effect this the following principle must be recognized and carried out: The parts must first be cleansed, and then exposed to the fullest extent by the application of adrenalin or some similar astringent, and finally the dichloramin-T oil sprayed into them until every crypt and recess has been completely reached. This thoroughness is absolutely necessary in order to secure the removal of the most deeply seated germs.

Used in the strength of two per cent. or less, the solution with chlorcosane is not irritating, although stronger solutions may be. Suitable atomizers are

* Abstract of paper read before the American Laryngological Association, May 27, 1918.

necessary. The success of this method has thus far been gratifying.

Where this method fails, in the presence of hypertrophied tonsils or adenoids, the removal of the latter may be necessary to affect a final cure.

The desire of the author is to furnish a method so simple in itself as to be readily carried out by the average practitioner, with the aid of apparatus inexpensive, durable, clean, compact of form, light of weight and therefore available for use under all circumstances of medical practice, whether civil or military.

The essentials to success are:

1. Recognition of the principle of the necessity for the complete exposure of the centers of infection.

2. The use of a proper spray atomizer.

3. The devotion of sufficient time and care to the effective carrying out of the treatment.

A TYPICAL ECTOPIC GESTATION: CHYLOUS ASCITES: FECAL OBSTRUCTION FROM LARGE CHOLELITH.

LEO BLOCH, M.D.,
LOUISVILLE, KENTUCKY.

CASE 1—G. A., a female, aged thirty-two, with negative family history. The patient has been married twelve years and has borne three children. The first child was delivered with forceps, and died at the time of birth. The two succeeding labors were normal, and the children are living and in good health.

In March the patient had a miscarriage, and the doctor who attended her said she was about three months advanced in utero-gestation. A peculiar feature about this pregnancy was that the woman menstruated at the regular time every month, the character and quantity of which she considered perfectly normal. Her menses began at the age of eleven, are of the twenty-eight day type, average duration seven days.

During the first week in the following September she noticed a tender area in the cholecystic region which she attributed to her having "caught cold." That night about ten o'clock she was awakened by severe abdominal pain located especially about the umbilicus. She described the pain as cramp-like in character and said it made her "double-up." She vomited twice during this attack which was followed each time by some relief from the pain. The next day she noticed considerable soreness throughout the entire abdomen. During the succeeding four weeks she suffered six similar attacks of pain. After each paroxysm she said she felt perfectly well and was able to perform her usual work. Careful inquiry developed no history of chills, sweats, nor air hunger at any time.

Physical examination: Patient shows evidence of anemia, and slight jaundice is present; abdomen swollen in lower right quandrant; considerable tenderness over cholecyst and right iliac region. Vaginal examination revealed mass in right tubal region not sensitive to the touch; uterus slightly elongated but movable. The urine was examined with negative findings. Pulse normal, temperature slightly elevated. Blood examination: R. B. C. 3,400,000; W. B. C. 16,500.

Celiotomy: right rectus incision. Upon opening the peritoneum blood literally poured out. The abdominal cavity was evidently filled with blood. The right Fallopian tube was the size of an orange and had ruptured. A small fetus was found free in the abdominal cavity attached to the tumor-mass by the umbilical cord. The right tube was ligated and removed. The free blood was allowed to remain in the cavity and the abdominal incision was closed without drainage. The patient reacted well from the operation and recovered without untoward incident.

So far as my experience extends this case is unique in that there were no clinical symptoms indicative of ectopic gestation. The usual manifestations were absent, i. e., shock and air hunger after rupture, amenorrhea, with the passage of portions of decidual membrane, vaginal and mammary changes, etc. In all the other cases of ectopic gestation which have come under my personal observation, the clinical symptoms have been practically typical and in consequence no particular diagnostic difficulties were encountered. In the case just cited, however, ante-operative differential diagnosis was a matter of physical impossibility, and the patient was subjected to celiotomy under the tentative and rather ambiguous diagnosis of "a surgical lesion in the lower right abdominal quadrant."

It might be remarked in passing that, in so far as the indications for treatment are concerned, diagnostic accuracy or inaccuracy in cases of this character is a matter of little consequence, prompt surgical intervention being imperatively demanded in practically every instance from the standpoint of the patient. Delayed operation in ectopic gestation is fraught with danger under any circumstances, and even in the absence of a typical history and the usual clinical symptoms, the surgeon is justified in

recommending exploratory celiotomy. Only by this method of procedure will the greatest benefit accrue to the largest number.

CASE 2—E. O., a female, single, aged fifty-three. Present illness began six months ago. Prior to that time she had enjoyed comparatively good health. At the time of my first observation there were evidences of advanced cardio-renal changes. Her urine contained two per cent. of albumin together with numerous hyaline and granular casts. There seemed to be an aortic stenosis, or at least an obstructive lesion at the aortic valve. The patient was sitting in bed having been unable to assume the recumbent posture for some time. She also had a very prominent thyroid gland, and a pronounced general ascites.

I saw this patient on consecutive days for a period of two weeks and administered the usual remedies advocated in such cases, such as jalap, magnesium sulphate, etc., without any appreciable benefit. The accumulation of fluid in the abdominal cavity became so great that paracentesis was finally required which was accomplished in the usual manner and nearly two gallons of fluid withdrawn from the abdominal cavity. To my great surprise the fluid was milky-white in color and evidently consisted of chyle. The patient died at the end of six weeks, paracentesis having been necessary at frequent intervals during the interim. Necropsy revealed a malignant neoplasm of the pancreas; that is, it evidently started in the pancreas and by extension had occluded the thoracic duct.

I might add that the thyroid enlargement rapidly subsided after the first paracentesis. The woman had been quite large all her life; at my first observation there was evidence of fluid in the subcutaneous tissues and she looked as if she then weighed about two hundred pounds. Following the paracenteses emaciation was rapid and at the time of death she weighed only eighty-five pounds.

Cases of chylous ascites must be rather uncommon, and this is the only one which has come under my personal observation. Moreover, so far as I am informed, only one similar case has been seen in Louisville during the last twenty years. The other patient was a male of fifty-five who consulted Dr. William C. Dugan because of tremendous ascites. Paracentesis was immediately practiced and two gallons of milky fluid withdrawn which was pronounced chyle. After the paracentesis a pancreatic tumor could be palpated. The fluid rapidly reaccumulated and during the succeeding two months paracentesis was necessary once per week. At one time four gallons of perfectly white fluid was removed. The patient was unable to assume the recumbent posture, he slept sitting in an arm chair with the tremendous abdomen hanging between his knees. Emaciation became extreme like a man in the last stages of starvation. Death occurred at the end of two months. Necropsy not permitted.

CASE 3.—B. C., a female, aged sixty years, a widow for twenty years, seen in consultation with the attending physician, Dr. W. H. Coleman, of Louisville. The patient is a pronounced asthmatic and according to the history has had three or four attacks of so-called biliary colic during the last ten or fifteen years. She is also a cardio-vascular subject.

Dr. Coleman was called to see this patient and based upon the symptoms present made the diagnosis of acute fecal obstruction. She had then been vomiting almost constantly for four days and fecaloid material had been regurgitated. During this time she had persistently refused surgical aid and would not consent to go to the hospital, remarking that "she would rather die at home." I saw the patient in consultation and concurred in the diagnosis made by the attending physician. And while she was not a good surgical subject, her condition was extremely serious and we concluded it would be advisable to send her to the hospital and take the chances of immediate operation as a life-saving measure.

Celiotomy: When the abdomen was opened the fecal obstruction was found to be due primarily to the presence of a large cholelith. The intestine had become twisted upon itself and its lumen thus entirely occluded. We untwisted the intestinal kink and pushed the cholelith with the accumulated feces downward into the rectum. The patient later voided the concretion per rectum, and I am glad to say made an uninterrupted recovery.

Cases somewhat similar in character to the foregoing are not uncommon, as investigation of surgical literature will amply testify; but complete fecal obstruction from a large cholelith with an occluding intestinal kink must be exceedingly rare, and for that reason the case appears of unusual interest. The patient was a cardio-vascular subject of sixty and practically in extremis when the aid of surgery was invoked or permitted, yet she successfully withstood the anesthetic and the necessary operative trauma, thus demonstrating that the aged and those with cardiac lesions are not always unfavorable surgical risks. The method of relieving the

obstruction also deserves especial comment. The intestine was not incised, but the kink merely straightened and the foreign body then aided in its progress toward the anal outlet by manual manipulation. The wisdom of this method of management is emphasized by the satisfactory ultimate outcome. The result might have been less favorable had the usual plan been followed, i. e., incising the intestine and removing the foreign body through the abdominal incision.

Letter to the Editor

Lt. Arthur E. Guedel, M. C., U. S. A.,
Base Hosp. 23, A. E. F.

Aug. 20, 1918.

MAJ. J. MACDONALD, JR., M. C., U. S. A.,
New York City.

MY DEAR MAJ. MACDONALD:

I wish that you might see the difference in the attitude of Mr. Every Day Frenchman toward the American uniform since the American fighting man has been busy over here. You see, in the beginning it took some time, a good deal of time perhaps, for the U. S. Army S. O. S. to get ready for the fighting man and during that time of preparation, which Mr. E. D. Frenchman could not altogether understand, he had lately been wondering whether or not the Americans really would ever get into the fighting as the French had expected them to do; and while there was never any lessening of the courteous treatment received by the Americans, there was beginning to appear or rather to be felt, an undercurrent of conjecture regarding what the Americans were going to accomplish in a fighting way.

However, that is now all past. The American has come into his own over here. He has made good with Mr. E. D. Frenchman as he has made good with himself. Nothing is too good for the American here during the past few weeks. He is made to feel at home as he never was before. To be able to observe this change, to be able to see the arrival of that which we were all sure would come, has been well worth a year of work on this side. And of course the good news is now to be all on our side until Germany yells "enough."

I should call this a pretty accommodating army, at least from the standpoint of the medical officer. The men higher up in the medical corps here try to give all of us just what we want in the way of special work, and the degree of success that they have attained in this is remarkable. There are but few medical officers here who are not doing the sort of work that they have asked for. And if they tire of the work that they asked for at first, their request for a transfer to other duties is usually honored.

There is the Casual medical officer who is sent over here attached to nothing, to be assigned to duty upon his arrival. That fellow has a lot to think about on his trip across. He wonders what he is going to draw and he has mental pictures of everything from the exciting and hard front line regimental duty, to the irksome job of dispensing pills or writing up records back in the rear some place. Although but few on their arrival want any of the front line stuff, it is surprising how many, after they have been here a few months, scramble to get assignments to just those places that they feared, namely, the front line jobs. Our directors seem to have followed the plan of allowing a man to learn from experience here what he wants to do and then putting him at that work wherever it is possible. As I have said, it is usually possible.

Many men who came over here with Base Hospital units have at their own request been placed on "surgical teams." The surgical team job seems to be one of the favorites. These teams consist of an operating surgeon, a surgical assistant, both medical officers, two surgical nurses, two surgical orderlies and an anesthetist, who may be either a medical officer or a nurse. This team is considered an itinerant unit and is sent from place to place wherever they may be needed to extract German souvenirs from the persons of our fighters who have been unable to get between the flying shell fragments and machine gun bullets of the enemy. That means that these teams travel around a lot and are always enjoying the thrill of the real game. Usually their work is in an evacuation hospital (casualty clearing station) during a rush period, with time for rest in the rear, between rushes. There is nothing prosaic about their work and there are remarkably few of them who are themselves placed on the casualty list.

In the quiet sector there is no need to keep a heavy force of medical officers. When the quiet sector becomes an active one, lending support to heavy action in front of it, the official force is augmented by these surgical teams. Officers who serve on itinerant surgical teams seem to be satisfied with their work, to like it, in fact, very much and do not want transfer to other work. I have known promotion to be declined on the part of the officer where such promotion carried with it a transfer from his team to other duties. There are always

many men in the rear who are ready to jump at a place on these teams.

As for the amount of work to be done here, this of course varies. We are always busy, even in the quiet periods, but there are times during the rushes when we are busy as we never thought we could be.

Different hospitals employ different methods of shifting their officers to fill out the twenty-four hour day with work, for in the rushes every hour is a working hour. The eight-hour shift is most commonly employed. Two teams are assigned to one table with eight hours' work and eight hours' rest. Others may employ the twelve-hour shift. And then there are times when a hospital will be caught in such a manner that one team must work straight through for twenty-four hours. This, however, is seldom the case, for other surgical teams are rushed to their assistance toute de suite.

How do we live? Usually the best we can, which is not bad at all. At the front the officers live in billets or dugouts, according to their assignment. In a rapid advance they may live in a ruined house or under any shelter that they can find, but our billeting officers here are a busy and efficient lot, and as a rule when an officer arrives any place there is a room awaiting his occupation.

In the rest camp, barracks are often the officers' quarters, but here, too, when there is an adjoining room, comfortable rooms are found for the time being. Those who are located in the bases have permanent and comfortable quarters.

The food over here is, I'll wager, better than you are getting at home. Most of us are in better health than we have ever been before.

As for news of the progress of the fighting, you get it there as well as we do here. But you do not get the tales of battle first hand from the wounded soldiers just off the field as we do. That in itself is worth being here to get. It is one thing to read a man's statements and another to watch his eyes while he is telling his story, which latter is exclusively our privilege. And such stories as they tell! We get them before they are cold to the narrator; when they are fresh and truthful and peppery.

My hat is off high to the American fighting man. There is nothing in the world that can beat him. We are mighty proud to be wearing his uniform. Since the American fighter has jumped into this game as he has, we are all of us carrying our heads pretty high. I wish you could see us swell up.

We are short of medical anesthetists here. That is, we are short of men who have made anesthesia a special study. In consequence of this, those of us who are here are placed in charge of that work in large hospitals or medical centers. The nurses are taught to do the ordinary work while we carry on a sort of general supervision and do the difficult work ourselves. I might say that I thought I knew a lot about anesthesia before I came over here, but I have learned so many new things here that I now feel I knew but little before. It has been well worth my while from the standpoint of education as well as from the standpoint of patriotism.

Honestly, I feel sorry for the deluded young M.D. back there who has not had the nerve to get into this thing. How sorry he is to be of his timidity at this time, he is not to know until after the war, and his opportunity has vanished. Give him my sincere sympathy. He is reaping his harvest of money now, but after this game is called, he is going to be a bit out of luck.

Some time in the future when I have nothing better to do I shall impose upon you another letter.

Kindest regards,

ARTHUR E. GUEDEL,
1st Lieut. M. C., U. S. Army,
Base Hosp. 23, Amer. E. F.

HOSPITAL REORGANIZATION.

The mobilization of civil hospitals in the interests of national welfare would probably lead to many forms of reorganization for the promotion of efficiency, but the results might work to the disadvantage of organizations that have been perfected through many years of labor and enthusiastic cooperation by physicians and laymen. It is of the utmost importance, therefore, for hospitals themselves to endeavor to weigh their own difficulties and bring about the needed readjustments. In preparing to meet the exigencies which have already arisen through the volunteering of a large proportion of medical men for military and naval service, through the limitation of the term of service of internes and their prompt registration in the Medical Reserve Corps, and through the regulations attendant upon the pursuit of the study of medicine, many serious problems have arisen. Added to these are the difficulties incident to securing an adequate number of nurses in training to supply the demands of the military and civil population. To meet the difficulties through a national program various plans have been suggested and whatever their outcome may be, the fact remains that internal reorganization must be begun at once by the hospitals.—*American Medicine.*

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WALTER M. BRICKNER, M.D., F.A.C.S., Editor

NEW YORK, DECEMBER, 1918.

A NEW SURGICAL MALADY.

The description of a new surgical disease certainly deserves comment no matter how unusual and trivial it may be. While the condition which Halsted (*Johns Hopkins Medical Bulletin,* Sept., 1918) describes under the name "Sinus Spud" is apparently quite harmless the disease nevertheless bears a considerable importance because, if unrecognized, it may be easily confounded with a malignant disease and so lead to a false prognosis. This was actually done by even so keen a clinician as Halsted. Halsted defines sinus spud as a "finger-shaped subcutaneous tumor of the perineum, quite free at its tip and with the hardness and elasticity of cartilage." This definition is not quite accurate because Halsted describes one of his four cases as occurring in the right iliac fossa, but from the description we feel ourselves free to be skeptical concerning the validity of this case. The remaining three cases, however, seem entirely consistent, and their true nature was proven by operation in two instances.

A short description of these three cases will suffice to indicate to the reader the real nature of the condition. The first was observed by Halsted 22 years ago. A physician noted a small, hard, teat-like, non-tender mass in the perineum which was diagnosed as a malignant tumor of the rectum. The tumor crossed the median line, was freely movable at its anterior, superficial portion and became less movable and more deeply fixed at its other extremity where it seemed lost in the bulbo-membranous urethra. At operation, Halsted found that the mass consisted of fibrous tissue surrounding a narrow sinus blind at both ends; the deep end of the sinus was in contact with the bulbo-membranous urethra but did not communicate with it. In the second case, a hard circumscribed slightly tender and freely movable mass was noted in the perineum. There was another smaller mass near the anal margin and the two were connected by a narrow strip of connective tissue. At operation the same conditions as noted in case I were observed—a sinus closed at both ends. A year later, however, a urethral fistula developed. The third case was not operated, but the physical findings were precisely those previously described; a year later the masses had completely disappeared.

Halsted is at a loss to definitely explain the pathogenesis of "Sinus Spud," but he believes it possible that at some previous time there may have been a urethral or rectal opening which had become closed. In no instance, however, was there a previous history of urethritis, but Halsted regards it as significant that in two of the cases one end of the sinus led to the same spot—the bulbo-membranous urethra. This fact would seem to exclude a rectal origin, although in one case the patient gave a history of having been operated for fistula-in-ano one year previously. Halsted believes the disappearance of the "Spud" in the third case may have been due to sterilization by an active inflammatory process, similar to that which occasionally occurs in sebaceous cysts.

We have deemed it important to call attention to this condition, not only because of the novelty of its interest, but also because some of our readers may have light thrown on their understanding of a condition that they may have met in the past but not recognized. This article of Halsted's, we predict, will probably give birth to many others.—E. M.

SOME HOMILIES CONCERNING ABDOMINAL SURGERY.

While our attention is being called to other things, we should not forget that the reaction of the human abdomen to disease and injury remains unchanged. There are certain verities of which the surgeon should constantly be reminded.

The peritoneum is extremely susceptible to infection; and being infected conveys disorder from one organ to another. No surgeon is competent to

deal with abdominal diseases unless he has an understanding of its pathology. Nor is a surgeon competent to invade the peritoneum until he has added to his knowledge a large experience as assistant and student under a master of the subject. This is because abdominal surgery can be learned only by experience. To open the abdomen for even the most simple disease may reveal complications the handling of which would try the most skillful surgeon. Conditions within the abdomen can never fully be revealed by external examinations. Only when the disease is uncovered to the sight or touch can the surgeon be assured of its character. In most cases of abdominal disease it is better that the disease be left to nature than that the peritoneum be invaded by an inexperienced or unskillful surgeon.

The oft-repeated conventionality that the after-care of surgical cases is as important as the immediate treatment is not well founded. In abdominal operations the fate of the patient is usually decided by what the surgeon does before the abdomen is closed.

Every abdominal disease is serious; and invasion of the peritoneum must always be regarded as a major operation. The idea should not be promulgated that certain operations are trivial affairs; it is unfair to the patient, and it encourages boldness in the inexperienced. Operations should not be undertaken to cure conditions which are amenable to less hazardous measures; and when undertaken they should promise the possibility of relief, and the hazard should not be unduly out of proportion to such possibility.

The surgeon should calculate the patient's reserve strength and operate at the propitious time. The emergencies, such as strangulated internal hernia, acute perforation of the intestine or gangrene of the bowel, offer little margin for such calculations. Nor can any of these be diagnosed positively except when exposed to view. On the other hand, an infected ovarian cystoma or a bleeding uterine fibroid, which are easily recognized, may require immediate operation, tentative operative relief, or treatment preliminary to a deferred operation. The surgeon must also take into account the relation of the patient's abdominal disease and the operation to disorders of the heart, kidneys and other organs. Arbitrary routine is not desirable; each case should be regarded as peculiar and receive the special consideration which its conditions demand.

Let surgeons not be responsible for the vicious teaching that abdominal operations can be done most anywhere by most anybody. Exposure and insult to the peritoneum should be minimized. Operations should be conducted with speed and precision; and by a surgeon with the golden rule in his heart.

Discourses to bystanders and audiences are best delivered not by the operating surgeon, but by another surgeon assigned to that special task—preferably an assistant of the operator. If the operator carries on the discourse, an assistant should be performing the operation. For the surgeon to converse and explain to bystanders, thereby delaying his work, is a crime not forbidden by statute but by a law of higher ethics. Only the competent should be licensed to perform these serious operations; and neither the interest of the surgeon nor that of the bystander should be paramount to that of the unconscious patient.—J. P. W.

TUBERCULOSIS AND THE WAR.

We do not dwell upon the upheaval the world has suffered through war. It is a commonplace that peace has its battles also; and in this connection it might be well to bring back into fresh memory the conception of a golden era as visioned by Pasteur, who felt that perhaps a day would arrive when the great scourges of diseases would be conquered, each possibly by a specific remedy.

For the problem of tuberculosis, there is no peace as yet, let alone a specific remedy. In civil life it constantly mobilizes its victims and takes its toll.

The great war has put on trial measures for saving life so carefully worked out during years of peace and in a sense, therefore, the war has become an experimental epoch.

To begin with, tuberculosis is almost a universal disease. Infection, as a rule, takes place in childhood. We have then to contend with the selection of military material from young men who nearly all carry with them at least a childhood infection with tuberculosis. It is apparent that the stress and strain of a terrific war, such as this one, would have some effect in the way of increasing or relighting old processes of tuberculosis, and yet Osler, Elliott and Schroeder have pointed out that the incidence of tuberculosis among the young men in our army is not greater than the incidence among our young men in civilian life at the same age period. On the contrary, there seems to be an increase in tuberculosis morbidity in some civilian populations since the outbreak of the war. (Thompson-Newsholme.)

The effect of poisonous gases plays no very large rôle in the etiology of tuberculosis, nor has trauma been a factor with special reference to the bones and

joints. On the other hand, physiological over-strain and undue exposure have undoubtedly been definite causes of tuberculosis and in a measure the many respiratory infections so prevalent in concentration areas were responsible for the fresh start of tuberculous disease.

For the surgeon a matter of no negligible importance has been the fact that during the extensive physical examinations of recruits many men were rejected as having pulmonary tuberculosis when the symptoms for this diagnosis were produced by pathological conditions of the nose, throat and sinuses (Rist). Also Elliott found that among the tuberculosis suspects there were many with collapsed lung, and gunshot wounds of the chest, followed by chest complications with consequent collapse of lung; and that there were also patients with bronchiectasis and lung abscesses.

The important point to bear in mind is that there is scarcely a sign or symptom of pulmonary tuberculosis which may not be the symptom or sign of a non-tuberculosis condition, at times of a surgical nature.

Stewart emphasizes that war has its blessings for tuberculosis after all. More accurate diagnosis and more universal resort to treatment in incipient cases; finer institutions for treatment, a saner appreciation of the tuberculous person in the community and a fuller utilization of the tuberculous man for service. These are some of the good things the war has already brought to the problem of tuberculosis.—H. R. M.

EMPYENA.

Extensive reports of the army medical men regarding the outbreak of respiratory disease at the camps during the past year have appeared. Early in the fall of 1917 an outbreak of pneumonia appeared in all of the camps, either as a primary affection or as a complication of measles. The outbreak assumed the characteristics of an epidemic, reached a fastigium, wore itself out, was followed by a recrudescence, and was practically extinct by the end of the following spring. The clinical picture was marked by the extreme degree of the illness, by the extraordinary numbers of complicating empyemata, by exceptionally rapid development, by an unexpectedly large mortality.

There were two groups: at Camps Wheeler, Beauregard, Hancock, Jackson, Logan, Sheridan and Travis the pneumococcus pneumonias predominated; at Camps Funston, Dodge, Custer and Lee the pneumonias were due mostly to the hemolytic streptococcus. Cole and McCallum state that the pneumococcus caused ordinary types of lobar pneumonia; that the streptococcus pneumonias usually followed measles and was broncho-pneumonic in character. In some the rapidity of devedopment of the pathological process facilitated an early localization of the lesion in the pleura, so that at post-mortem examinations little or nothing was found in the lung parenchyma, and the little was gathered subparietally and indicated, morphologically, a secondary pulmonary involvement.

In all of the empyemata the rapidity with which the exudate gathered in the pleural cavity was remarkable. In one of the cases described 1,500 cubic centimeters of fluid accumulated within sixteen hours of the primary symptoms. The fluid was rather thin with the streptococcus infections. These were the sickest patients. In some the course was indescribably fulminant with an overwhelming toxemia, and no method of treatment seemed of any avail; in others the picture was of a milder nature, or was slower in development, or the poisoning was more quickly overcome by the natural protective forces of the body. The largest mortality followed the measles empyemata; and was during January.

Numerous methods of treatment were employed. The best method included repeated aspirations of the accumulated fluid until the toxicity of the process had begun to subside; thoracotomy usually without rib resection, and the treatment of the cavity with Dakin's solution. Aspiration alone yielded the worst results.

Within the past eight weeks the wide pandemic-like distribution of influenzal pneumonias was noteworthy for the absence of pleural complications. Indications of their recrudesence are, however, beginning to appear.—A. O. W.

NO MORE PHYSICIANS TO BE COMMISSIONED IN THE MEDICAL CORPS.

At ten o'clock on the morning of Nov. 11th, the War Department discontinued the commissioning of physicians in the Medical Corps.

This condition, in all probability, is permanent and no further consideration will be given applicants for a commission in the Medical Corps until further notice.

Surgical Sociology

Ira S. Wile, M.D., Department Editor.

AFTER-WAR SURGERY.

The wheels of war have slowed up. The peace station is in sight. The tremendous forces propelling the huge war machine are being braked and speed is reduced to the minimum permissible with safety. The war is over insofar as forces of destruction are concerned, but the struggle for construction and reconstruction must continue for many months to come.

Among the numerous factors entering into the successful conclusion of the world war none has been of greater effectiveness than the organized medical work of the Army, Navy and Public Health Service. The distinctions between military and civil surgery are more than academic, as has been demonstrated by the types of wounds that have been treated, by the character of infections that have existed, by the numerous advances in technic that have been achieved, and by the methods of co-operation which have so successfully grown out of the problems of battle injuries.

In the processes of reconstruction now under way it is highly probable that surgery will be affected. It is difficult to prophecy the far reaching results of military experience upon civil practice. It is permissible to suggest that among the gains to be noted in the future will be found a more complete articulation of the laboratory and clinical side of medicine, even in smaller communities where state aid may be required. The establishment of diagnostic clinics and the alteration of surgical teams into "group medicine" would scarcely be surprising. The extension of Health Insurance, Workmen's Compensation Laws, Maternity Insurance, Ambulance Zone Systems, Central Dressing Stations, and an increase of special hospital facilities would in no way arrive unexpectedly.

The impetus given to surgical specialties will not be lost. The vast experience with plastic technic, the treatment of suppurating wounds, the surgery of the brain and spinal cord, the management of compound and comminuted fractures, oral surgery and malformations due to loss of tissue or scars; the handling of visceral perforations and attendant complications, the care of burns, gangrene and tetanus will be reflected in the improvement of technic in the treatment of accidents and injuries in civil and industrial life. Hygiene, sanitation, prophylactic inoculations, serum therapy, occupational therapy, shell shock management represent practical fields of effort whose status has been partially fixed by the costly experiment of war surgery.

The surgical standards of the country will have been raised by reason of the gross experience of a large proportion of the medical profession of the country who have had opportunities for self-development and education under government auspices to a degree greater than has ever before been possible in the history of surgery. Radiographers, anesthetists, laboratory workers, and, indeed, surgeons have been developed in large numbers so that all parts of the country will be benefited through the return of these more highly trained and expert surgeons. It is possible, too, that their capabilities will be enhanced by virtue of the remarkable *esprit de corps* and high morale which have been a natural consequence of work under pressure, and in co-operation for the attainment of the splendid results which have marked the service of the medical corps. The closer understanding of medical and surgical problems, the constant interchange of ideas, the release from competition, save along lines of achievement, will bring with it a better spirit and a higher mutual regard and respect among members of the surgical fraternity.

Among the serious problems to be solved, none is greater than that of the re-establishment of surgeons in civil life. The sacrifice of professional work brought about by enlistment creates a situation which cannot be relieved immediately. The gradual return of the medical forces will cover many months, and the process of reassimilation will, therefore, involve a long period of time. It is obvious that all positions formerly held by those now in national service should be open for those desiring to take advantage of them. There is a distinct moral obligation on the part of the profession to aid in every way and facilitate the restoration of professional opportunities to those who so freely gave them up for patriotic reasons. Similarly, there is an obligation to assist in every way possible those who return to secure re-establishment in civil practice. Various difficulties may arise in the rehabilitation of those who have suffered injuries, but fortunately, this number is small, and there should be no obstacles in promoting their successful adaptation to specific fields of effort.

Possibly a small proportion of the medical men will remain overseas to take up their work in foreign lands where the depletion of the medical profession has established large opportunities for men of capability and initiative. Medically speaking, the United States alone of all the belligerent

nations is in a condition of professional balance. The ratio between physicians and population may be decreased without resulting in danger to the vast population, particularly, as our medical colleges have been protected and the graduates therefrom will be adequate to supply the constant needs of our people. The total casualties of the United States probably have not been more than 100,000, but the population will undoubtedly be decreased by reason of the emigration that has occurred, and that will continue as a result of an attempt to reconstruct devastated lands.

The conclusion of hostilities has brought an end to the hazards of war. The total destructive consequences to America numerically are not great. The constructive agencies which have been liberated and developed are innumerable. The evaluation of the achievements of the medical profession is impossible at the present time. It is safe to assert, however, that humanity as a whole has gained by virtue of medical military experience. There will be a greater expression of democracy in medicine and medical practice. The spirit of humanity for which the war was fought will be elevated through the greater service stimulated by the loyalty, devotion, enthusiasm and conscientious efforts of the more than 33,000 medical men whose service stars adorn the honor flag of the medical profession.

Book Reviews

Anatomy of the Human Body. Henry Gray, F.R.S., Fellow of the Royal College of Surgeons; Lecturer on Anatomy at St. George's Hospital Medical School, London. *Twentieth edition.* Thoroughly revised and re-edited by Warren H. Lewis, B.S., M.D., Professor of Physiolcgical Anatomy, Johns Hopkins University Baltimore, Md. Illustrated with 1247 engravings. Lea & Febiger, Philadelphia and New York, 1918.

Sixty years ago the first English edition of Henry Gray's anatomy was published. The first American edition followed in 1859. Although the twentieth edition has been thoroughly revised and re-edited, it still follows the general plan utilized in the first edition. It continues to be the foremost descriptive anatomy in the English language.

The present edition differs from its predecessors in that special sections on Embryology and Histology have been distributed among the subjects under which they naturally belong. Recent advances in the study of the ductless glands and nervous systems are reflected in the re-writing of the sections dealing with these subjects.

With the enrichment of the text by numerous illustrations, with the modernization of the descriptive matter, the editor has succeeded in bringing this exemplary volume abreast of modern anatomical science. Gray's Anatomy continues to deserve the high and incontestible position among the works of anatomy, whether in the hands of the student, specialist, or the general practitioner who desires at times to refresh his mind or to refer to a substantial and reliable authority for guidance in the performance of his daily tasks.

Surgical and War Nursing. A. H. Barkley, M.D. (Hon.), M.D., F.A.C.S., Lecturer at Good Samaritan Hospital Training School for Nurses; Consulting Surgeon, Good Samaritan Hospital, Lexington, Ky. With 79 illustrations. St. Louis: C. V. Mosby Company, 1918. Pp. 201. Price, $1.75.

War nursing has produced numerous little problems differing somewhat from the ordinary routine of civil nursing practice. As a special book for students of nursing, the author has presented material derived from his experiences as a lecturer and as a surgeon in the United States Army, together with the information gleaned by his familiarity with recent surgical technic as modified by military conditions during the present war. The work is well arranged, excellently illustrated, and covers the general field indicated by the title in a most satisfactory and helpful manner.

The Surgery of Oral Diseases and Malformations. Their Diagnosis and Treatment. George Van Ingen Brown, D.D.S., M.D., C.M., F.A.C.S., Major, Medical Officers' Reserve Corps, U. S. Army; Oral Surgeon to St. Mary's Hospital and to the Children's Free Hospital and Columbia Hospital, Milwaukee; Fellow of the American Medical Association; Member of the National Dental Association; Chairman of the Section on Oral Surgery of the Fourth International Dental Congress, etc. *Third Edition.* With 570 engravings and 20 plates, and a selected list of examination questions. Lea & Febiger, Philadelphia and New York, 1918. Pp. 703. Price, $7.00.

No phase of war surgery has been of greater worth than that devoted to the repair of mutilations of the jaws and face that have arisen from the use of high explosives. Oral and plastic surgery has achieved unusual eminence in the restoration of human faces to some shadow of their former form. The third edition of Brown's valuable book is rich in material, illustrative of the accomplishments of oral and plastic surgery. Its full value, however, is not dependent merely upon the description of the treatment of wounds under war conditions. Throughout the entire volume there is evidence of careful compilation of practical and useful methods for the surgical treatment of all the oral diseases and malformations which afflict man. There is a happy combination of viewpoint of the dentist and the surgeon with an appreciation of the practical importance of their co-operation in the attainment of the best results of treatment.

The general plan of previous editions has been followed, though almost every chapter has been improved by virtue of added new material or a re-statement of facts in the light of greater knowledge. The advancement of oral surgery is well reflected, and the new edition is most welcome to those students carefully observing the development of a new specialty in surgery.

Surgical Applied Anatomy. By Sir Frederick Treves, Bart., G.C.V.O., C.B., LLD., F.R.C. Eng., Serjeant Surgeon to H. M. the King; Consulting Surgeon to the London Hospital; late Lecturer on Anatomy at the London Hospital. *Seventh Edition,* revised by Arthur Keith, M.D., LL.D., Aber., F.R.C.S. Eng., F.R.S., Hunterian Professor and Conservator of the Museum, Royal College of Surgeons of England; formerly Lecturer on and Senior Demonstrator of Anatomy at the London Hospital; Examiner in the Universities of Aberdeen, Cambridge, etc., and W. Colin Mackenzie, M.D., Melb., F.R.C.S. Edin., F.R.S.E. Member of Council of the Anatomical Society of Great Britain and Ireland; formerly Lecturer on Applied Anatomy, University of Melbourne. Illustrated with 153 figures, including 74 in colour. Lea & Febiger, Philadelphia and New York. Pp. 674. Price, $3.00.

Thirty-five years is a long life for any book. None, however, has been of more service to the student of surgery than the work so familiarly known as Treves' Applied Anatomy. Additional material has been added by the present authors of the seventh edition, particularly along the line of what they have termed "Orthopædic Anatomy."

The experience of military surgery has not added very much to the subject matter, though naturally wherever modification or alteration was required, it has been made. Its field of service is now greater than ever when haste is demanded to increase the general surgical knowledge sufficient for efficient practical work. In size, form, spirit, accuracy and usefulness it continues the high standard of excellence which has ever distinguished this book since its celebrated author sought to prepare for the profession a book which "should make the dry bones live."

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by HOBART AMORY HARE, M.D., assisted by LEIGHTON F. APPLEMAN, M.D. Volume III, September, 1918. LEA & FEBIGER, Philadelphia and New York, 1918.

With the excellence of Progressive Medicine, the September issue presents the usual digest of improvements, advances and discoveries in medical and surgical science. The subject matter included in Vol. III are Diseases of the Thorax and Its Viscera, Including the Heart, Lungs and Blood Vessels, by William Ewart, M.D., F.R.C.P.; Dermatology and Syphilis, by William S. Gottheil, M.D.; Obstetrics, by Edward P. Davis, M.D.; Diseases of the Nervous System, by William G. Spiller, M.D.

The wonted high standard of value is enhanced by the review of articles on Gas Therapy and Transfusion, and the discussion of Anesthetics in Labor, together with the Relation of the Glands of Internal Secretion to Obstetrics.

Fibroids and Allied Tumors (Myoma and Adenomyoma). Their Pathology, Clinical Features and Surgical Treatment. By CUTHBERT LOCKYER, M.D., B.S., F.R.C.P., F.R.C.S., Vice-President Obstetrical and Gynecological Section, Royal Society of Medicine; Obstetric Physician to Out-Patients, Charing Cross Hospital; Corresponding Member of the Société Obstetrique Belge, etc., etc. With an introductory notice by ALBAN DORAN, F.R.C.S. With 316 illustrations, including 37 coloured plates. MACMILLAN & Co., Ltd., St. Martin's St., London, 1918. Pp: 603, octavo. Price, $25.00.

The present volume on Fibroids is not the most exhaustive treatise on this most common of uterine tumors that has appeared in the literature. It is nevertheless as comprehensive as any book dealing with this subject need be.

The chief feature of the book is the discussion of the pathology of fibroids, the material for the description of which has been especially abundant. The author lays, with proper justification, special emphasis on this important aspect of fibroids and his ample personal observations are sufficiently rich to entitle him to describe in his own way the pathology of myomata. For clearness of description of the histogenesis, gross development, and secondary changes of these tumors we have not met its equal.

Not an unimportant feature of the book is the attention given to the changes in neighboring organs associating myomata and also to the question of a complicating pregnancy. This last chapter, in the light of the author's unusually large experience, is a distinct contribution and may well serve as a guide in the management of any case of myoma in a pregnant uterus. The author favors the continuance of pregnancy to term whenever feasible and unless urgent symptoms, as torsion of the myoma, should require surgical interference. At term, one of several surgical procedures is then to be followed in order that a live baby may be delivered. Not infrequently a tumor which appears to threaten obstruction may be displaced in the course of the pregnancy or at term during labor and a living child be born per viam naturalis. Where dystocia is actually threatened one of the well established classic procedures may be followed with the view of a favorable delivery If a myomectomy be for some reason determined upon, the author states that the gravid uterus is tolerant to a considerable degree of surgical manipulation.

Myoma occurring in extra uterine tissues and organs receives extensive detail in the book. But the special type of myoma—the adenomyoma—engages the author's attention in the second part of the book. Lockyer follows Cullen's classic work on this subject and amplifies it, enlarging the pathology of adenomyoma by a new classification. The clinical features of this, as well as of the more common tumor, the myoma, receive careful attention and operative indications are clearly laid down in accordance with the mature experience of the author.

Part III deals with operations for myoma and includes a chapter on the treatment of post-operative and pre-operative pelvic and abdominal complications. The author adheres strongly to the belief that no one should undertake the surgery of the pelvis unless he has the requisite knowledge and experience to deal with intestinal and other complications.

The book is profusely and beautifully illustrated in a manner not unmindful of those of Howard Kelly and Cullen's publications. To these latter authors, Lockyer expresses his indebtedness for a number of illustrations on adenomyoma.

Genitourinary Diseases and Syphilis. HENRY H. MORTON, M.D., F.A.C.S., Clinical Professor of Genitourinary Diseases in the Long Island College Hospital; Genitourinary Surgeon to the Long Island and Kings County Hospitals and the Polhemus Memorial Clinic; Member of Committee on Veneral Diseases in the Office of the Surgeon-General; Consulting Genitourinary Surgeon to the Flushing Hospital, to the Sea View Hospital of Department of Health, New York City; to the Bushwick Hospital, and to the Beth Israel Hospital of Newark, N. J.; Member of the American Association of Genitourinary Surgeons; Member of the American Urological Association; Fellow of the American College of Surgeons; Fellow of the New York Academy of Medicine, etc. *Fourth Edition*, Revised and Enlarged. With 330 Illustrations and 36 Full-Paged Colored Plates. St. Louis, C. V. MOSBY COMPANY. 1918. Pp. 794. Price $7.00.

Re-writing surgical books during war periods does not enable the author to bring to bear a full weighing of all the evidence regarding technic. Despite this fact, the Fourth Edition of Morton's book is acceptable because the newer discoveries and methods that have been evaluated are given due space and treatment. Particularly valuable is the discussion of the high frequency current in the treatment of benign tumors of the bladder and the presentation of the general subject of the diagnostic value of the *x*-rays, together with a discussion of the intensive method of using salvarsan and mercury.

The general arrangement follows that of the preceding editions, and the illustrative material continues to be rich in variety and unusually well selected from the standpoint of clarifying the text. As a standard book upon the subject, the author has been peculiarly fortunate because of the splendid cooperation he has received from the publishers insofar as typographical work is concerned.

Concerning Some Headaches and Eye Disorders of Nasal Origin. GREENFIELD SLUDER, M.D., Clinical Professor and Director of the Department of Laryngology and Rhinology, Washington University Medical School, St. Louis. 115 illustrations. C. V. MOSBY COMPANY, St. Louis, 1918.

A well written, somewhat verbose essay on a subject of tremendous interest to the rhinologist and, when its significance is more widely comprehended, to the internist and neurologist as well. Dr. Sluder has presented most of the subject matter in various papers during recent years, his first contribution being in 1900. The book is well and profusely illustrated. The text is good. The author, with his vast knowledge of his subject and a desire to make his points definite and unmistakable, repeats himself often and tends to become a little involved.

There is an introduction by Dr. Jonathan Wright, who has done the pathological studies necessitated by the investigations. His part deals with the microscopic anatomy and pathology of the subject of the essay. The main body of the book is in three chapters. The first, Vacuum Frontal Headaches with Eye Symptoms only. There is a short description of similar ethmoidal headaches.

Chapter two deals with the Syndroms of Nasal Ganglion Neurosis and the author describes his method of treatment and points out why the technic has not been as successful in some other hands as in his own.

In the last chapter he takes up hyperplastic inflammation of the sphenoid sinuses and discusses it in the relation of the sinuses to the second, third, fourth, fifth and sixth cranial nerves, the Vidian nerve and the nasal ganglion. A description of his technic for nasal accessory sinus operations follows.

The book concludes with a number of case histories illustrative of the text.

The Doctor's Part. What Happens to the Wounded in War. JAMES ROBB CHURCH, A.M., M.D., Colonel Medical Corps, U. S. Army. With Foreword by MAJOR-GENERAL WILLIAM C. GORGAS, Surgeon-General, U. S. Army. Illustrated. D. APPLETON AND COMPANY, New York, London. 1918.

Books about the war are almost as numerous as the sands of the sea, but there is always room for one which is as expressive of the life of the surgeon in military activity as the one written by Dr. Church. He has presented in simple and most readable non-technical English a vast amount of information which he selected from his storehouse of experience as an observer with our Allies, and later as a member of the staff of the Commanding General of the American Expeditionary Force. To be at home but to feel the touch of war with the part that the physician plays, one needs but to read this most interesting, refreshing, and stimulating book.

Books Received

Dispensaries. Their Management and Development. A Book for Administrators, Public Health Workers, and All Interested in Better Medical Service for the People. MICHAEL M. DAVIS, JR., Ph.D., Director of the Boston Dispensary, and ANDREW R. WARNER, M.D., Superintendent of Lakeside Hospital, Cleveland. New York: THE MACMILLAN COMPANY, 1918. Price, $2.25.

Abstracts of War Surgery. An Abstract of the War Literature of General Surgery that has been Published Since the Declaration of War in 1914. Prepared by the Division of Surgery, Surgeon-General's Office. St. Louis: C. V. MOSBY COMPANY, 1918. Price, $4.00.

Roentgen Diagnosis of Diseases of the Head. DR. ARTHUR SCHULLER, Head of the Clinic for Nervous Diseases at the Franz-Joseph Ambulatorium, Vienna. Authorized translation by FRED F. STOCKING, M.D., M.R.C. With a Foreword by ERNEST SACHS, M.D., Associate Professor of Surgery in Washington University. Approved for publication by the Surgeon-General of the United States Army. St. Louis: C. V. MOSBY COMPANY, 1918. Price, $4.00.

Vaccines and Sera. Their Clinical Value in Military and Civilian Practice. A. GEOFFREY SHERA, B.A., M.D., B.C., Cantab., M.R.C.S. Eng., L.R.C.P. London; Honorary Captain R.A.M.C.; Clinical Pathologist to the British Red Cross Hospital, Netley; late Clinical Pathologist, Central Military and V. A. D. Hospitals, Eastbourne; late Clinical Assistant (medical) Evelina Hospital for Children, S.E.; late R. M. O. Fulham Infirmary, S.W. With an introduction by SIR CLIFFORD ALLBUTT, K.C.B., M.D., F.R.S., Regius Professor of Physics, University of Cambridge. London: HENRY FROWDE, HODDER & STOUGHTON, OXFORD UNIVERSITY PRESS, Warwick Square, E. C., 1918.

Progress in Surgery

A Résumé of Recent Literature.

Avoidable Traumatic Abdomen. J. B. DEAVER, *Journal American Medical Association*, October 5, 1918.

The text is of a patient who had been operated on twelve years before and in which he found a hemostatic forceps, 8 inches long, one-half in the sigmoid and the other half in the lower ileum which it and perforated, producing a spontaneous ileosigmoidostomy. The case seems unique in the length of time the foreign body had been carried without causing trouble and the unaccountable manner in which it had separated and found lodgement in different parts of the bowel. In spite of the purulent peritonitis with adhesions, some of which it was unadvisable to separate, the patient made an uneventful recovery and was discharged in good condition one month after operation. The methods used to prevent such accidents are often cumbersome and are all liable to fail. In the last analysis the proper organization of the operating room is the vital factor for the prevention of such mishaps. The essentials are absolute quiet, a permanent staff of well trained, reliable assistants, each assigned to a particular task, whose conscientious and concentrated attention to this task and unremitting persistence in tracing any piece of gauze or instrument that may be missing is second only to the vigilance of the operator himself. Fortunately a beneficent provision of nature protects the peritoneal cavity to a large extent, but more often this entails a secondary operation immediately after the first or, as in the case reported, at a remote period. The outcome, however, is not always so lucky, as death or troublesome complications occur in more than a quarter of the cases. Other avoidable traumatisms are perforations of the uterus by use of too sharp curets. The fingers of the experienced surgeon are better than any curet, and still another avoidable traumatism is rupture of the uterus from carelessness or ignorance of the obstetrician or the reckless use of pituitary extract. The safest course in treating such an accident is abdominal section, but everything possible should be done to avoid it. Lastly, Deaver speaks of the use of nitrous oxid gas, which he has found useful for short operations, but does not advocate for more extensive and prolonged work. It does not give complete anesthesia or relaxation, and the amount of gas to be given is difficult to determine and is apt to divide the surgeon's attention more than with ether anesthesia in the hands of a competent anesthetist.

Gunshot Abdominal Wounds. J. R. EASTMAN, *Journal American Medical Association*, September 28, 1918.

There is a discussion on the advances that have been made in the treatment of abdominal gunshot wounds during this present war. Notwithstanding the fact that experience has modified the old views as to the advisability of delay in abdominal wounds, there still remains a sharp difference of opinion, notably in France, between those who trust to the development of symptoms for the diagnosis of penetration and perforation and those who prefer early laparotomy. There is not always an aperture of exit of the bullet to show its course. All missiles may ricochet, and Eastman has seen cases where, if it had followed a direct route, many vital organs would have been perforated and yet there was no serious injury. There are a few recognized rules to follow. The closer together the entrance and exit the less the chance of penetration, and Rochard declares that if a man does not cease to complain of abdominal pain a perforation is almost certain. Rochard also says that if a patient passes gas at the anus there is no perforation. All rules fail sometimes, excepting these three which show perforation: escape of bowel contents from the wound, protrusion of perforated intestine at the wound, and passing of the missile by the anus. The common signs of perforation are eumerated, such as pain, costal breathing, shock, abdominal rigidity, retraction of the testicle, etc., and the author adds the symptoms also of abdominal hemmorrhage. Any of these may suffice to determine the propriety of operating. Among the deciding

criteria are the nature of the missiles, whether smooth, deformed, etc. The question of transportation, the permanence or nonpermanence of the operative station, and the factor of time are to be taken into account. At the beginning of the war all surgeons were abstentionists, and Eastman gives statistics of operations by both methods which seem, if anything, more favorable for the interventionist. What may be called the internationally accepted treatment in nonoperative cases consists in rest in the recumbent position with shoulders raised and knees flexed. If the patient is moved before operation the Fowler position should be maintained during transport. Of course, abstention from food and care as to administration of water and anodynes are included. The more common injuries to the intra-abdominal organs, their symptoms and treatment are described at length, as are also those of combined injuries of the chest and abdomen, which are not uncommon.

Dakin's Solution and Dakin's Oil in the Normal Peritoneal Cavity of the Dog. E. G. GREY, Baltimore, *Johns Hopkins Medical Bulletin,* Oct., 1918.

Both the neutral solution of chlorinated soda (Dakin's solution) and dichloramine-T in chlorinated paraffin (Dakin's oil), when injected into the normal peritoneal cavity of a dog, lead to an inflammatory reaction, the degree of which is directly proportional to the amount of chlorin antiseptic used. With a sufficient quantity (less of the oil suffices) death ensues.

When either of the chlorin antiseptics is injected into the gall-bladder of a dog no abnormal symptoms appear. Following the injection of the oil, however, the gall-bladder becomes thickened and shrunken, though the remainder of the biliary tract shows no discernible changes.

A small amount of Dakin's oil, when injected into the normal pleural cavity of an unanesthetized dog, may lead to a rapid (reflex?) death.

Since Dakin's oil, particularly, has been used without recognizable ill effects in certain infections of the abdominal cavity, the results from the experiments outlined above suggest that the wall of an abscess cavity or sinus must play an important part in protecting the peritoneum in general from the effects of the free chlorin. They also suggest that the maintenance of an adequate drainage tract is an indispensible part of the technic for using antiseptics of this nature within the abdomen. Until more evidence is at hand, then, both of the chlorin antiseptics should be used in intra-abdominal infections with caution and certainly only in carefully selected cases.

Mesenteric Vascular Occlusion. ARTHUR A. EISENBERG, A.B., M.D., and HENRY A. SCHLINK, A.B., M.D., *Surgery, Hynecology and Obstetrics,* July, 1918.

Mesenteric vascular occlusion is not an extremely rare condition, there now being collected about 400 cases.

The occlusion is most frequently in the arteries.

By far the most common lesion produced is hemorrhagic infarction of the intestine.

The most common cause of the occlusion is embolism resulting from infection and injury.

There is no difference clinically between the arterial and venous occlusion, regardless as to whether it is due to embolism or thrombosis, in the superior or inferior vessels.

The clinical diagnosis should be made on sudden onset, acute colic-like abdominal pain, distention and tenderness, signs of shock and collapse; often there may be vomiting and constipation; if diarrhea is present, it is most always accompanied by melena.

Cautery Excision of Gastric Ulcer. D. C. BALFOUR, *Annals of Surgery,* June, 1918.

Balfour summarizes the advantages of this method:

The cautery efficiently destroys the focus of infection without sacrificing nature's protective surrounding area of induration. The method may be applied in a large number of lesions and entails a minimum of risk; the motor functional result is superior. It obviates early and late postoperative hemorrhage. The late results are better. It can be used where other methods are not available. It should always be accompanied by gastro-enterostomy.

Acute Dilatation of the Stomach. WILLIAM DOOLIN, *British Journal of Surgery,* July, 1918.

This condition is apparently of more frequent occurrence than is usually believed and the primary distending agent is probably air swallowed during the narcosis. Gastric distention is followed by duodenal obstruction, and gastric atony is necessary for its occurrence. Early recognition and the prompt use of the stomach tube is necessary to prevent the secondary duodenal obstruction. When fully developed operation is unnecessary because of its futility. Use of the prone position and the replacement of the fluids lost have saved many desperate cases.

The Use of Fascial Transplants in War Surgery. L. C. BALLEUIL and W. D. JACK, *Annals of Surgery,* July, 1918.

Experiences are described of the use of aponeurotic grafts for the repair and restoration to function of scars, of muscles, tendons, or nerves, for which physiotherapy is useless. The operative technic is simple and includes the complete excision of the old scar into healthy tissue before the graft is applied.

Surgery vs. Radium in the Treatment of Carcinoma of the Bladder. B. S. BARRINGER, New York, *New York State Journal of Medicine,* Nov., 1918.

Barringer has attained most encouraging results in the treatment of 43 cases. Most of these (41) were in the advanced inoperable stage. Of the latter five are well (the longest 23 months), as determined by cystoscopic examination. He believes that radium has a distinct advantage over surgery in the treatment of cancer of the bladder.

Observations of Bladder Injury in Warfare. COL. ANDREW FULLERTON, *British Journal of Surgery,* July, 1918.

Injuries of the bladder form a very small number of the total wounds and derive their importance from the associated injuries, which latter include those of the bones of the pelvic girdle, and especially of the rectum and small intestine. Pelvic cellulitis is a frequent complication. The mortality is approximately 30%. The chief sequelæ are necrosis of bone, persistence of cystitis, calculus, and stricture formation at the neck of the bladder. Accumulation of infected fluid, blood clot or feces must be prevented by attention to the original wounds, aided, if necessary, but suitably planned incisions. Attention is necessary to the pelvic cellular spaces as well as to the interior of the bladder. The after-treatment should include frequent bladder irrigations to prevent cystitis and stone formation.

A Note on the Treatment of Wounds of the Genital Organs in Warfare. CHARLES CUMSTON GREENE, *Annals of Surgery,* September, 1918.

Wounds of the scrotum and testicle are fairly common. In simple contusions simple humid dressings suffice. Foreign bodies should be immediately removed. Not uncommonly the gland protrudes through the wound. The protrusion should be reduced after proper cleansing and should be covered, as far as possible, with its tunica. In bad cases the organ should be covered with a wet dressing and developments awaited. Simple irreducibility of the gland is never an indication for primary castration. When the gland is outside its coverings for a number of days, it is withered and castration may be necessary; in this case account should be taken of the neighboring organ.

Diverticula of the Bladder. E. S. JUDD, *Annals of Surgery,* September, 1918.

The general features of a series of 44 cases are described and the results are given; all but ten are living. Two of the patients died within a few days after a drainage operation from septic kidney conditions. The other deaths occurred after the patients had gone home. The general and functional results in the remaining 34 cases were good.

The Surgery of the Double Kidney. YOUNG and DAVIS: *Surgery, Gynecology and Obstetrics,* July, 1918.

The condition of double kidney and ureter is not rare, and the upper half is most often the seat of disease; its surgical importance is therefore great. The advent of ureteral catheterization, radiography and pyelography has made the diagnosis easy and we should expect the discovery of more cases in the future. The radical cure by excision of the diseased half of the kidney with its pelvis and ureter is undoubtedly the method of choice.

Sacro-Iliac Relaxation. W. B. OWEN, *Journal American Medical Association,* October 5, 1918.

A discussion on the frequency of recurrence and persistence of pain and discomfort incident to relaxation of the sacro-iliac synchondrosis, following child birth, prolonged illness and excessive pelvic strain as indicating the need of better devices for a more efficient type of support for these cases. The greatest difficulty in the use of such apparatus, so far devised, has been the maintenance of continuous support. While claiming no originality for the device here described, Owen says he has had no knowledge of a similar one so far, but if such exists he can recommend it from his own experience. "To insure proper results, the device must be maintained in such a position that the lower border is on a line with the greater trochanter and the pubic arch, and at a corresponding level over the sacro-iliac joint. In other words, the support must be maintained as low as possible, and at the same time allow the patient to assume the sitting posture without discomfort. No matter how carefully applied the ordinary belt will invariably slip upward, and where perineal straps are used to prevent this they cause so much discomfort from pressure on the perineal region that it becomes necessary to loosen them, and the supportive efficiency is thereby lost. It has been my practice to have the apparatus made of bleached drilling doubled, the fixation skeleton resembling a pair of short pants extending from the crest of the ilium to the middle of the thighs following the gluteal fold, with a loop on each side through which passes a heavy elastic belt 1½ inches wide. The best results will be obtained by having the support fitted directly to the patient before it is completely finished." The author has used this particular type of support in more than 200 cases of sacro-iliac relaxation or strain. And, excepting in two non-typical cases, has completely relieved the symptoms. Twenty-four of the patients came to his office on crutches. All have been closely followed.

Mechanical Derangement of the Knee-Joint. MELVIN S. HENDERSON, *Annals of Surgery, June,* 1918.

These derangements are usually produced by a damaged internal semilunar cartilage, by loose osteo-cartilaginous bodies, and by the external semilunar cartilarge. Loose bodies of extrinsic origin produce derangements but are not frequent in civil practice. Loose bodies *per see* demand removal. A history of mechanical derangement owing to a damaged semilunar cartilage should not be operated, unless the locking is repeated or reduction cannot be accomplished in any other way. In properly selected cases the operative results are excellent.

The Treatment of Gunshot Wounds of the Face, Accompanied by Extensive Destruction of the Lower Lip and Mandible. MAJOR V. H. MAZANJIAN and CAPTAIN HAROLD BURROWS, *British Journal of Surgery,* July, 1918.

The early treatment includes those of shock and hemorrhage and of sepsis, which last is usually not severe and becomes rectified within a few days. The special dangers include obstruction of the glottis, because the parts fall back, having no support to hold them up in front. Sometimes raising the wounded into a sitting posture is sufficient; when not, tracheotomy is necessary. Another danger is an inhalation pneumonia. A general anesthetic is therefore contraindicated. The patients are fed by a nasal or small oesophageal tube.

The mandibular function is restored by preventing deformity or displacement of the remaining fragments and by a removable splint which is inserted between the fragments. The buccal furrow is carefully retained, or is reestablished by an appropriate incision with the addition to the apparatus of a suitable flange.

The restoration of the lower lip makes use of the skin of the cheeks and neck by various plastics which are described and illustrated in the text.

Atlas and Axis Luxation. CHARLES M. JACOBS, *American Journal of Orthopedic Surgery,* October, 1918.

Many cases of suddenly acquired rigid neck, associated with abnormal positions of the head, which cannot voluntarily be corrected, are probably subluxations of the atlas. The reported cases of distention luxation seem to show that there is a distinct affection resulting from infection which is not associated with trauma. In traumatic dislocations the severity of the symptoms and prognosis are proportionate to the amount of force expended. Great force need not necessarily produce dangerous compression, if sufficient support and time are afforded for repair to take place. Again, sufficient force applied to the atlas could prove fatal immediately. If the atlas dislocation is the result of a lesser force the striking thing is the mild symptoms resulting. The treatment of distention luxation is no different than in traumatic luxation. The method of reduction by manipulation under anesthesia is not without danger in either variety. The most essential feature after reduction has been accomplished is the immobilization of the head until the ligaments have had time to heal. Operative procedure, as devised by Mixter, is advisable when reposition of the vertebra has not been accomplished by other methods.

Laminectomy and Regional Anaesthesia. CHARLES H. FRAZIER, *Annals of Surgery,* July, 1918.

Regional anesthesia is appropriate in the thoracic region of the spine. A method of paravertebral anesthesia has been elaborated for the cervical region, but because of danger to the phrenic nerve, infiltration anesthesia is recommended. In the lumbar region spinal anesthesia is the method of choice. The mortality of laminectomy per se has been reduced to that of an exploratory laparotomy.

Treatment of Fracture of the Neck of the Femur. FRED. H. ALBEE, *American Journal of Orthopedic Surgery,* August, 1918.

The various methods of treating fracture of the neck of the femur is discussed and the various disadvantages of each are commented upon. The author's practice is to make use of a bone-graft peg in every operable case in which the fragments are loose or unimpacted. The steps in the operation are described.

Gunshot Fractures of the Mandible. JOHN B. ROBERTS, *Annals of Surgery,* September, 1918.

Gunshot fractures of the mandible are essentially open fractures and in most cases osteomyelitis and other infections follow. Necrosis may impede union. Violent primary or secondary hemorrhage may occur. Unintelligent treatment may cause union to occur with great deformity, malocclusion of the teeth, or facial disfigurement of the scar. The various methods are described for correctly treating this injury. The best results are obtained by dentist and surgeon working together. Bone transplantation operations, and various plastics are constantly necessary.

Sur L'amputation de Cuisse en Chirurgie de Guerre (Thigh Amputations in War Surgery.) J. MARTIN, *Revue de Chirurgie,* January-February, 1918.

Indications and the technic of the operation are given. When properly performed under general anesthesia there is no extraordinary risk. The bad results of the cases in the eaarly part of the war were due to improperly performed operations, and those done at too late a period. Brilliant results were obtained with gas gangrene, and the amputation did not seem to aggravate the infection. Very satisfying results were obtained with the ordinary grave infections.

Notes on Excisions of Joints. ROBERT B. OSGOOD, *American Journal of Orthopedic Surgery,* October, 1918.

This short paper deals only with the question of excision of joints for the control of sepsis and not with the primary excision to prevent sepsis and gain first intention healing, after the method of superiosteal resections as advocated by Le Riche. By present methods, if the cases can be operated upon within 24 hours, these septic joints ought not to occur but they will probably continue to be encountered often enough to make the policy of their treatment of some importance.

The Endobronchial Treatment of Bronchiectasis and Bronchial Abscess. E. MAYER, New York, *New York Medical Journal,* Oct. 19, 1918.

This method was introduced by Yankauer about a year and a half ago, and the method has been continued by Mayer, who reports the progress thus far. Yankauer has devised a double bronchoscopic tube, one being used for suction, the other for irrigation. After a preliminary morphinization and cocainization the bronchoscope is introduced into the abscess cavity, and the secretion is sucked out; the cavity is then irrigated with saline solution, which if well borne, is followed by an irrigation with an iodine and carbolic acid solution. The treatment is done twice weekly without any serious result. So far Mayer believes the results of his method of treatment show that distinct progress has been made; the secretion is less, the odor has disappeared and the general condition of the patient has improved.

The Advisability of Totally Excising Both Pectoral Muscles in the Radical Operation for Cancer of the Breast. WILLY MEYER, *Annals of Surgery,* July, 1918.

The total extirpation of both pectoral muscles in their undisturbed and uninvaded anatomical connection with relation to the breast, as described in this communication, is claimed to offer an additional safeguard not only against local and regional recurrences, but in all probabilities, also against metastatsis.

The Prognosis and Treatment of Empyema. JOHN HOMANS, *Annals of Surgery,* June, 1918.

Homans differs from Lilienthal in regard to the need for the latter's operation of major thoracotomy for empyema; and pleads for a more careful study of the empyema cavity before (if possible), during, and after the original drainage operation with the idea of adopting at the earliest favorable moment the particular procedure, if any, which is essential to healing. Having this in mind the original operation would properly consist in rib resection as the safest life-saving measure.

The After-Effects of Wounds of the Chest and Their Treatment. JOHN MEAKINS and T. W. WALKER. *Canadian Medical Association Journal,* October, 1918.

Deformity of the chest wall is a very important disabling after-effect of gunshot wounds of the chest. This deformity follows most frequently prolonged involvement of the pleural cavity. The early and persistent evacuation of fluid from the pleural cavity, either by aspiration or operation, is of great importance in preventing the development of deformity. Especially is this so in cases of hemothorax. The early use of special exercises is beneficial in preventing or overcoming this deformity. The prognosis in this condition is exceptionally good under suitable treatment.

Mixed Tumors of the Salivary Glands. ALEXANDER FRASER, M.D., *Surgery, Gynecology and Obstetrics,* July, 1918.

The mixed tumors arise from the ducts of adult glands. No claim is made that true neoplasm has been experimentally produced, but the experimental results justify the conclusion that the primary structures of the mixed tumors may easily arise from the ducts of the adult gland.

The endothelial theory has no foundation in fact. All the so-called endothelial structures are easily explained as natural modifications of primary duct formations. The most common one, viz., the peritheliomatous formation, is a figment without histological basis.

Injury, such as localized or partial obstruction of ducts, probably plays a prominent part in the origin of these tumors.

The cartilage is developed from the epithelium of the parenchyma of the tumor. This claim will undoubtedly meet with strong opposition.

The Action of Chlorine on Suture Material. G. L. SERVASS, Reno, *Medical Record,* Oct. 12, 1918.

Servass had occasion to sew a superficial wound with silkworm and chromic acid gut and applied a wet dressing saturated with one of the chlorinated compounds. At the end of ten days he found to his amazement that both the silkworm and chromic suture had softened up just as ordinary catgut would. He thereupon experimented by placing silkworm gut and even silk in test tubes covered with the same percent chlorinated solution as was used on the dressing and found that at the end of a few days both were useless as suturing material. The author warns therefore against the application of chlorinated dressings in instances where such materials are used and when it is important that the sutures should hold for a long time, as for instance, in laparotomy wounds.

Primary and Delayed Primary Suture of Gunshot Wounds. Report of Research Committee, CAPT. FORBES FRASER, Director, *British Journal of Surgery,* July, 1918.

Wounds infected with hemolytic streptococcus nearly always became infected, and usually there was marked suppuration with severe constitutional disturbances. The advantage of delaying the primary suture consists in the fact that after two or three days, even when cultures are not made, the appearances of the wound are so distinctive, as to enable one to say whether the wound ought or ought not to be sutured.

It is possible to suture a large number of the wounds, after thorough cleansing without the the use of antiseptics and obtain union. The wide excision, recommended by the French, is not advisable in all cases, as it may leave a useless limb.

A bullet track made by an undeformed bullet is usually sterile; when the wound of exit is large and that of entrance is small and track-like, only the exit wound is apt to be infected.

Fibrin Paper as an Hemostatic Agent. SAMUEL CLARK HARVEY, *Annals of Surgery,* July, 1918.

Bleeding from many small vessels, from vessels in delicate tissue and from sinuses can be controlled by the application of fascia, muscle and fibrin. The peculiar advantage of the use of these tissues is that they can be left within the wound, thus avoiding the danger of stripping the coagulum. A method is described for converting fibrin into a fabric easily kept, sterilized and applied. This material is found to correspond in effectiveness and amenability to absorption with the untreated fibrin, while being far more adaptable to the operating room technic.

Ventriculography Following the Injection of Air Into the Cerebral Ventricles. WALTER E. DANDY, *Annals of Surgery,* July, 1918.

The outlines of the lateral cerebral ventricles can be sharply demarcated by the *x*-ray if air is substituted for cerebrospinal fluid. Air has no deleterious effect. The method has proved of practical value in the diagnosis and localization of many intracranial conditions. It is is invaluable in internal hydrocephalus.

Preliminary Report of a Method for Estimating in Vivo the Germicidal Activity of Antiseptics. JOSEPH A. PERKINS, *Annals of Surgery,* September, 1918.

The old method of making bacterial counts is not considered reliable in gauging the activity of the antiseptics. It is recommended that cultures be made frequently (every two hours) for obtaining correct impressions.

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THE OPEN METHOD OF ETHERIZATION*

ISABELLA C. HERB, M. D.
CHICAGO, ILL.

The most helpful aids to the advancement of our work as anesthetists are the critical analysis of errors and the investigation and discussion of the reasons for post-operative complications and fatalities during narcosis. That anesthetic accidents during and following narcosis are in a large measure avoidable cannot be gainsaid. Many are due to lack of training, carelessness or to over-confidence in the safety of the agent being administered. The last group agree with Shakespeare in feeling that there is "No danger in what show of death it makes." However, those who are not observant or attentive to detail, although properly trained, will never make first class anesthetists either from the viewpoint of the patient's welfare or the surgeon's comfort.

Complications during anesthesia may be classified under two heads, (1) improper selection of the anesthetic agent and (2) faulty administration. It is not always easy to determine the proper share of blame which should be attributed to the surgical procedures in the post-operative complications, but this does not hold true in case of death during operation. Fatalities during anesthesia, when the patients are not moribund on entering the operating room, are due to improper selection or administration of the anesthetic, to a central respiratory or cardio-vascular paralysis produced by a toxic dose of the anesthetic agent or agents (combined anesthesia) to cerebral hemorrhage in patients suffering from sclerotic arteries with high blood pressure, or accidental hemorrhage during the operation. Death due to operative procedures other than hemorrhage occurs after the patient is returned to bed.

Fleming,[1] in a review of inquests held in England, shows that out of 700 deaths occurring during anesthesia, 521 were due to the anesthetic. Of these patients 223 died before the operation was begun. His statistics are interesting and instructive.

Chloroform	378
Ether	28
C. E., A. C. E., and A. C.	100
Nitrous oxid	12
Ethyl chlorid	6
Spinal	8
Scopolamin	2
Hedonal	2
Local	6
Not specified	158

In analysing these figures one is at once impressed by the dominance of fatalities under chloroform and it is difficult not to attribute them to the improper selection of the anesthetic agent, although the inexperience of the administrators may have been a contributing factor. Flemming is undoubtedly correct in his belief that this appalling death rate would not have occurred if ether had been administered instead of chloroform. From a purely scientific point of view these statistics serve to show the great need of reform in the selection and administration of anesthetics.

Too much credit cannot be given to the laboratory workers, that army of men and women who study for weeks or months on a single problem to prove or disprove a theory, to erase or put on a firmer foundation practices in medicine or surgery. Few, if any, representative surgeons or internests would be willing to-day to attempt a diagnosis, much less to institute a line of treatment, without the aid from the pathological, bacteriological and X-ray laboratories. The work of these medical allies cannot be ignored by the anesthetist if he would advance the science of anesthesia. However, it must not be forgotten that laboratory workers lack clinical experience and therefore their deductions are not always reliable. For example, to ascertain the real facts and expose the utter fallacy of recent published statements[2] with reference to the open method of etherization there is necessary only a very little clinical experience, a very little observation unbiased and unprejudiced to prove that the picture described is so foreign to the actual condition of the patient that it is impossible to harmonize the two. However, it is quite incomprehensible how ether can act so differently when given by two people using the same method of administration and the same brand of ether. Is it the gun or the man behind it which controls the situation?

Let us for a moment consider the introduction of ether into the body by other channels than the respiratory system.

ETHER-OIL COLONIC ANESTHESIA.

The ether-oil colonic anesthesia has many advantages over the ether-vapor rectal anesthesia. Upon superficial observation the method is so simple that it has attracted the unwary. Upon close inspection, however, it is at once evident that it has not only distinct limitations but also distinct disadvantages. Adults are given one ounce of a 70 per cent. solution (6 oz. of ether and 2 oz. of olive oil) for every twenty pounds of body weight; that is, a man weighing 140 pounds would be given seven ounces. Children are given a 50 per cent. solution. The personal equation enters so largely in drug susceptibility that it would appear hazardous to attempt

*Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917. Chairman's Address.

to figure the dosage on the basis of body weight and age. Not to have the anesthetic under immediate control in case of untoward accident, as for example in sudden severe hemorrhage, is a distinct disadvanage which the merest tyro will recognize. We are told that if at any time the patient shows signs of a too profound anesthesia a portion of the mixture should be withdrawn. While this in itself is a simple procedure the disorder occasioned by such a necessity during a major operation must be considered. What assurance have we that the injected solution will remain in the rectum, especially if the operative requirements place the patient in the Trendelenburg position? Is it not possible that the solution had already passed into the colon and caecum in the reported cases of respiratory depression? If such is true the futility of an effort to quickly recover it through lavage is evident. Inasmuch as the ether is excreted by the lungs, if respiratory depression develops less ether is eliminated, while at the same time it continues to be absorbed from the rectal solution which in turn still further depresses respiration. Another objection to the method is the inability to regulate the depth of narcosis to suit the operative requirements during the different stages of the operation.

Reports[3] indicate that occasionally rectal irritation, which may prove quite distressing, or end in death, follow this method of etherization.

INTRAVENOUS ANESTHESIA.

Ether is soluble in normal salt solution to the extent of 10.8 per cent. by volume. At first a 10 per cent. solution was injected (2 oz. of ether to a pint of saline). It was found that this concentration produced a transient hemoglobinuria. Test tube experiments of a 5 per cent. solution (1 oz. to a pint of saline) mixed with blood showed no laking. A count of red cells taken at intervals during operation showed no hemolysis. Later experiments indicated that a 7 per cent. solution was equally free from risk. The advocates of the intravenous method of etherization contend that by thus introducing ether directly into the circulation a smaller amount is required to induce and maintain anesthesia. In comparing the amount to that used in inhalation and insufflation the fact that a considerable quantity is lost through evaporation and waste in the latter methods should not be lost sight of. It has been shown experimentally that a certain ratio between the blood and ether must be maintained or the degree of narcosis will vary. As the amount of circulating fluid is increased by the saline in the anesthetic so the amount of ether must be increased to the proportion that the saline bears to the original volume of blood to maintain the same degree of narcosis. If the amount of circulating fluid present is constant the depth of narcosis is influenced by the percentage of ether administered. It is claimed that this method is of special advantage in patients who are likely to be benefited by saline infusion either because of hemorrhage, shock or low vitality.

Coburn[4] concludes: "That in the normal individual about eight ounces of saline are required for induction of anesthesia and consequently at the end of induction there is about 5 per cent. more ether in the system than is required in other methods; at the end of an hour of surgical anesthesia the excess is 15 per cent. At the end of a long operation the excess would be more than doubled." It is readily conceivable that a larger amount of ether may be administered than is actually required to maintain anesthesia, although within the limits of safety. Whether the surplus is in the vessels or tissues it must be eliminated. The late toxic effects may thus be increased. Aside from these objections there appears to be more bleeding and some danger of pulmonary edema. The method will never become popular because of the somewhat complicated technic required in its administration. There is great danger of septic thrombosis unless administered under perfect asepsis.

OPEN ETHER.

The *Open Method* of etherization was originated and developed by Dr. Lawrence H. Prince in 1893. At that time he gave a description of the method and reported two series of administrations each containing five hundred patients. The essayist had the good fortune and privilege of being associated with Dr. Prince during his investigations and in 1898 reported her first thousand administrations. As a student and interne and later as an anesthetist she had had ample opportunity of seeing not only the discomfort of the patients during the induction period but the post-operative complications which could be traced to the ether narcosis. It is not surprising then that a method of anesthesia which eliminated the disadvantages of the one in use was hailed with delight and immediately adopted. After a very large experience I can say now in all truth that I have reason "for the faith that is in me." The superiority of the method is evidenced by its steady growth in popularity.

According to the statistics of the Committee on Anesthesia of the American Medical Association more than half of the ether anesthesias administered from 1905 to 1912 were by the open method. This method of administration does not preclude se-

quence or combined anesthesia if desired, nor does it mean that the anesthetic cannot be selected to suit individual requirements. Furthermore, the simplicity of the method should not argue against its efficiency.

TECHNIC OF OPEN ETHER.

The manner in which ether is administered during the induction of narcosis spells comfort or discomfort for the patient and makes for his future attitude toward anesthesia. Ether may be given as a sequence to nitrous oxid and oxygen which doubtless is the most agreeable method for the patient. However, many hospitals are not equipped with an apparatus for the administration of nitrous oxid and oxygen, consequently a method which gives the greatest amount of comfort to the patient and at the same time is safe is most desirable. Ethyl chlorid and ethyl bromid may be given in place of the nitrous oxid and oxygen. They possess the advantage over nitrous oxid and oxygen in that they are more easily carried about and require no special apparatus for their administration, but the mortality attendant upon their use is so high that few anesthetists care to assume the extra risk of administering them.

Preparation of the field of operation during the induction of anesthesia serves a double purpose: it shortens the length of narcosis and helps to divert the mind of the patient from the anesthetic. The confidence and cooperation of young children as well as adults can be readily secured if a moment is taken to explain what you are going to do and why you are doing it. Make the patient feel that you are not unmindful or careless of his anxieties and you will be more than repaid by seeing him relax his muscles, smile and not infrequently say: "All right, I'll do anything you say if you will promise to stay with me throughout the operation."

Before beginning the anesthetic the patient is told to breathe naturally, not to force his respiration, and while the mask is held away from the face the ether is slowly dropped on various points of the cover. As the patient becomes accustomed to the odor the mask is gradually lowered till it rests on the face. The rate of dropping is now increased until the entire cone cover is moist. In a few minutes a piece of gauze is placed around the cone or the cone may rest on a gauze ring pad which encircles the nose and mouth, to shut out the air which passes under it, thus all the air which the patient receives is more or less impregnated with ether vapor. When the cone cover is too thick, as, for example, when two layers of stockinet and ten or twenty layers of gauze are used, the method ceases to be open and may be termed the semi-closed method. With the latter technic more ether is required to moisten the cover, and the patient's exhalations to a considerable degree are retained within the cone and are reinhaled. The oxygen supply is thereby greatly diminished, the effect of which is shown by more or less cyanosis. Two layers of fine, closely woven stockinet or its equivalent in gauze is all that should cover the mask. Stockinet makes a better evaporating surface than gauze. If the cover is too thin it is difficult or impossible to induce and maintain anesthesia. The ether should be dropped continually on the cone. If the dropping is suspended till signs of returning consciousness appear an uneven narcosis results. Intermittent administration has the further disadvantage or danger of administering a too concentrated vapor in one's haste to get the patient *under* again. It should be remembered that a concentrated vapor will do more injury to lung epithelium in a few minutes than a dilute vapor will do during a long anesthesia. It has been shown that a 6 or 7 per cent. vapor is the greatest concentration which can be inhaled without irritation to the air passages. The depth of narcosis is controlled by the amount of ether dropped on the cone and can be varied to suit the operative requirements. To have the cone more than saturated is a waste of ether, as it runs off the cover. When the proper technic of the open method of etherization is carried out, narcosis develops along the lines of natural sleep and it is a rare exception not to have a smooth anesthesia with relaxed muscles and perfect oxygenation throughout the most difficult operation. Contrary to the teachings of some anesthetists, we have no hesitancy in saying that, barring operations which call for insufflation (intrapharyngeal, intratracheal) anesthesia, the open method is suitable for any patient or any operation in which ether is the anesthetic of choice. We have employed this method of anesthesia with equally good results at all ages ranging from thirty-six hours (spina bifida) to ninety-six years (carcinoma of the face) and in all conditions of health from the marasmic infant to the athlete, from the frail patient suffering with severe heart lesions to the obese alcoholic. From observation of the work of other anesthetists and as an instructor we have found that trouble during induction and maintenance has invariably been due to faulty technic and not to the open method of etherization.

It is a mistake to think that this method is *foolproof*. An overdose of ether can be easily given, although the danger is not so great as when

less air is allowed as in the rebreathing or closed methods.

ADVANTAGES OF OPEN ETHER.

The superiority of the open method of etherization does not rest upon faith but upon demonstrated facts. One of the greatest, if not the greatest advantage which this method possesses is the large amount of oxygen which the patient constantly receives. This fact is readily determined by observing the ears, face and color of the blood. There is not an intermitting pink and duskiness as when the rebreathing method is used, but the blood oxygenation is constant and normal throughout the narcosis. It therefore naturally follows that the toxic effects are lessened and this has been shown to be the case. Gatch's[5] studies lead him to the conclusion that: "The severity of the pulmonary lesions found after experimental etherization by the closed method can be satisfactorily accounted for by the great concentration of the ether vapor and the greater liability to aspirate mouth contents when these are used." Dresser[6] found that: "The ether vapor within the closed mask sometimes reached a concentration as high as thirty-four per cent. while 6 or 7 per cent. is the strongest concentration which can be inhaled without irritation to the air passages." He regards any concentration of vapor which cannot be inhaled by a conscious patient without coughing as harmful to the lung epithelium. Poppert[7] likewise concluded from his experiments that the greater the ether concentration the more irritating to the lungs. Offergeld[8] studied the pathological changes in the lungs which occurred after an etherization lasting from seventy to eighty minutes. His results were obtained in guinea-pigs, rabbits and cats after using the closed method, a mixture of ether and oxygen and by the open method. The animals which did not die were killed at various periods after the narcosis. With the closed anesthesia some of the animals died in a few days from bronchopneumonia. Some were killed in two or three days and their lungs showed patches of bronchopneumonia, fatty degeneration and desquamation of bronchial epithelium and hemorrhage into the alveoli. None of the animals that were given ether and oxygen died. If killed at the end of the first day, patches of consolidation with some blood and desquamation of epithelium were present in the bronchi. With the open method there were no deaths. Two days after the anesthesia, necropsy showed a perfectly normal condition of the lungs. When the closed method was used it required four days for the mildest cases to repair. The difference in anesthesia as maintained by the open and closed methods is quite apparent. When an asphyxial factor is introduced the accessory muscles of respiration assist in the effort to obtain a sufficient supply of oxygen. The result is labored breathing with more or less heaving abdominal movements. The presence of anoxemia is evident by the congestion of the venous system as shown by the bluish color of the ears, lips, cheeks and blood. The respiratory tract is especially affected by the general venous engorgement which increases the size of the tongue and surrounding structures and thus a mechanical obstruction is produced which is further aggravated by the increased flow of mucus. Closed ether administration is particularly unsuitable for florid, stout persons, who become alarmingly cyanosed when subjected to air limitation. When an abundance of air or oxygen is allowed there is no congestion of the capillary vessels and consequently there is little oozing of venous blood from the wound. The pulse is of good volume and blood pressure is well maintained.

FALL IN TEMPERATURE.

In a series of patients anesthetized by the open method we found the temperature (rectal) following operations lasting thirty-five minutes or more, averaged a fall in the male patients of 0.67 F. and in the females 0.27 F. The patients upon whom these observations were made were well covered, as is our custom, during the operations, the parts to be operated upon alone being exposed. Davis and McCarthy[9] in a recent publication call attention to the fall in temperature during natural sleep. The observations were made upon children who were without fever and without ailments which might cause variations in temperature. The rectal temperature was taken just after the child had fallen asleep and again after an interval of two hours without waking the child. The fall during two hours sleep was 0.9 F. in the males and 0.41 in the females. Why the fall is so much greater in the males than in the females in both series we are unable to explain. It will be observed that the fall during natural sleep is twice as great as that during narcosis and as these authors suggest it is possible that the decrease in body temperature during etherization is analogous to that occurring in natural sleep.

WARMED ETHER VAPOR.

That there is any virtue in warming ether vapor to body temperature is questioned by such able observers as Sellig,[10] Meltzer,[11] Cotton and Boothby,[12] Bevan,[13] McCarthy[9] and Davis and others. However, inasmuch as it is considered of value by some anesthetists an investigation was instituted to determine the temperature of the vapor within the cone at the point of inhalation.

* * * *

The thermometer was so arranged that it did not come in contact with the patient's face. It was found that the average temperature was about 87.6 F., that is, relatively near body temperature. McCarthy and Davis[9] have shown that, "A further increase of heat is gained by the time the mixture has reached the pharynx, so that the entire warming process is accomplished before the anesthetic enters the respiratory tract proper." The space within the cone to some extent forms a mixing chamber for the vaporized ether and air. This space also allows a slight degree of rebreathing, the amount of which depends upon the thickness of the cone cover. It naturally follows that the thinner the cover the less rebreathing there will be and the more oxygen the patient will receive. We have found that in vaporizing ether for intrapharyngeal insufflation that there is an advantage in warming the liquid ether; not because of any value in warm vapor but because when air is forced over or through liquid ether the warm ether vaporizes more readily and consequently less air is required to carry the same amount of ether.

PRESERVATION OF BODY HEAT DURING ANESTHESIA.

Of much greater importance than warming the ether vapor is the conservation of body heat during anesthesia.[14] Vierdort[15] gives eleven calories per hour as the normal elimination of heat by the lungs, and ninety calories by the skin. When these figures are contrasted, the necessity of preventing the loss of heat by the skin through radiation, evaporation and conduction is apparent. The loss of heat can be prevented by covering, or even raised above normal if the patient is surrounded by hot bottles.

A word regarding ether may not be amiss. Any ether which forms *snow* on the cork or wick when left standing or which freezes on the cone cover during administration should be discarded as being unsuitable for the open method of anesthesia. With such an ether it is difficult, often impossible, to maintain an even, smooth anesthesia and, furthermore, a much larger quantity is required which offsets the difference in price.

CONCLUSIONS.

1. When ether alone is administered the induction of narcosis by the open method of etherization is comparatively comfortable.

2. With the open method of etherization, the blood is well oxygenated throughout the narcosis and the patient leaves the operating table with normal respiration and normal color.

3. Barring operations which call for insufflation anesthesia the open method is suitable for any patient or any operation in which ether is the anesthetic of choice.

4. Experimental evidence shows that with the open method of etherization there is less injury to the lung epithelium than when the closed or semi-closed methods are employed.

5. Trouble during induction or maintenance of anesthesia is invariably due to faulty technic and not to the open method of etherization.

6. The conservation of body heat narcosis is of greater importance than warming the ether vapor.

110 S. ASHLAND BLVD.

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ETHER AND ETHERIZATION IN RELATION TO INFECTION AND IMMUNITY.*

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The subject assigned to me in this symposium by your committee will be approached from the practical rather than the laboratory viewpoint. A cursory review of the literature on the intraperitoneal use of ether in patients suffering of peritonitis will show that a preponderance of the evidence bespeaks its beneficial influence.

Souligoux in the *Semaine Medicale,* May 13, 1914, refers to a method of treating septic peritonitis by the introduction of ether into the peritoneal sac as proposed by Morestin in the *Bull. et Mem. Soc. de Chir. de Paris,* February, 1913, and Temon in the May, 1913, issue of the same journal. Souligoux practiced flushing the infected area with ether and removed by sponging before placing drainage tubes and closing the abdomen and was

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convinced that this method of using ether not alone possessed merit but that it had actually saved a number of patients suffering of peritonitis that would have died had not the method been employed. The fact that some of his patients died thirty hours later and some immediately after the use of ether did not disconcert this intrepid observer, as he had often seen death during the course of anesthesia in patients suffering of peritonitis wherein ether irrigation had not been used.

Phelip and Tarteis, *Annales de Gynecologie et d'Obstetrique,* December, 1913, report sixteen cases of peritonitis in children due to appendicitis in which they used ether lavage with seven deaths and nine recoveries.

Janneret, *Rev. Med. de la Suisse Romande,* 1913; Waterhouse, *British Med. Jour.,* Feb. 6, 1915; Haines, *Transactions Cincinnati Academy of Med.,* 1915; Haines, *Transactions Miss. Valley Med. Assn.,* 1916, and Morton, *Women's Med. Journal,* 1916, have reported numerous cases illustrative of the beneficial influence or ether used intraperitoneally in conjuction with the usual postoperative treatment of peritonitis.

Waterhouse employed ether intraperitoneally in fifty-nine patients suffering of peritoneal infections with a mortality rate of 3.23 per cent. and believes that the addition of ether played a conspicuous part in reducing the death rate. He thinks that ether not only inhibits the growth of germ life, but actually destroys many of the germs and improves individual resistance by stimulation of the circulatory and nervous systems, thus enhancing the patient's chances of recovery.

For the past two and one-half years the writer and his assistants have used ether intraperitoneally in all patients suffering from peritonitis coming to operation at our hands, in the Cincinnati General Hospital and in private practice. At the Indianapolis meeting of the Mississippi Valley Medical Association last year, I reported to the Surgical Section on a small series of patients wherein ether had been used in conjunction with operation, drainage and other postoperative measures in the treatment of peritonitis. The mortality was 13.1 per cent. Since that report was made forty-three cases have been added with a mortality of 9.13 per cent., making a total of sixty-six cases with seven deaths, or a mortality of 10.4 per cent. for the entire series.

This series includes gastrointestinal perforations from disease, gunfire and stab wounds, abortion, leaking pus tubes and tuberculous peritonitis.

In a number of the more virulent cases ether was introduced through the drainage tube several times during the first and second days succeeding the operation. Postoperative complications, including shock, prolonged anesthesia, vomiting, dilatation of the stomach or heart, dysuria, septic thrombophlebitis and gaseous distention of the intestines were not more frequent, severe or prolonged as compared with similar patients operated upon prior to adopting ether in the treatment of peritonitis.

In a fair percentage of the cases primary union was obtained throughout the line of incision and the patients recovered without going through a process of sloughing of the abdominal wall, frequent dressings, prolonged stay in the hospital, postoperative hernia and morbidity so frequently encountered in this type of infection.

Encouraged by the beneficial results obtained following the use of ether in peritonitis we gradually enlarged the field of application to other infected regions of the body; scalp wounds complicating skull fracture, other open fractures, osteomyelitis, tuberculous abscess cavities, sinuses, broken-down tuberculous testis, abscess of the thyroid, infected lymphatics and septic wounds of other soft structures, with very gratifying results.

Ether used locally certainly surpasses all other methods in preparing the scalp, axilla, pubes and scrotum for surgical procedure. We have in but one instance followed the practice suggested and practiced by the late Dr. J. B. Murphy of injecting ether into an infected joint cavity after aspirating the contents. The patient had had an osteomyelitis of the femur which had perforated into the knee joint cavity. The result in this instance was negligible, the patient refused to submit to an amputation and death followed.

L. Picque, *Press Medicale,* Aug. 19, 1915, and L. Ombredanne, *Bull. et Memor. Societie de Chirurgie,* report a large number of cases of gas gangrene wherein they had used ether after removal of foreign bodies and establishing free drainage. After thoroughly irrigating the wound with ether they introduced pledgets of lint which had been steeped in ether into the various cavities and recesses and applied a large compress saturated with ether over the entire field, this in turn was covered with cotton and other dressings with a view to preventing rapid evaporation by excluding atmosphere. Dressings were changed twice daily and the results were surprisingly good in that the infectious process was checked in from three to six days, although crackling and gangrene were present in some of the cases before treatment was instituted.

Dressing gas bacillus infections in this manner is a violation of the decrees of all previous surgical

experience and the clinical results obtained by these observers furnish conclusive proof of the beneficial influence of ether not alone in immunization but likewise in the absolute destruction of germ life. The theory advanced by Gardner that ether and colloidal silver act by killing the bacteria or lessening their growth, thereby lessening the output of agressins, is well supported by the experience of Picque and Ombredanne.

Objection has been made to the intraperitoneal use of ether because it favors the production of adhesions. Law, *Trans. W. Surg. Assn.,* 1914, in his laboratory experiments in the artificial production of peritonitis washed the soiled surfaces with ether before closing the abdomen. This result showed absence of general adhesions, slight omental attachment and a few guy-rope-like adhesions between coils of intestines. There were fewer adhesions than in the controls and when ether did not prevent it seemed to mitigate all forms of intraperitoneal adhesions. Personal experience gained by reopening the abdomen for ileus and other postoperative condition has led the writer to conclude that the formation of adhesions is dependent upon some inherent condition in the patient's makeup rather than to the type of infection or the use of ether intraperitoneally.

It has been the experience of every surgeon to operate in the presence of extensive peritonitis and encounter few or no adhesions, also to operate in mild infections and find extensive adhesion formation. There are some opinions contained in current surgical literature anent the cause of adhesions which need revision and others which require confirmation to be convincing.

Instances have been recorded wherein disaster followed so soon after the introduction of ether as to convince the surgeon that death was due or at least hastened by the presence of ether in the peritoneal sac. Our observations lead us to conclude that although not devoid of danger ether has very slight toxicity when placed in the peritoneal sac, we have seen no untoward results which could be directly attributed to the use of ether in this manner. In many of our patients sloughing of the abdominal wall at the site of the drainage tube and along the line of incision did not follow the operation and in those cases wherein sloughing did occur it was not as extensive as we had witnessed prior to the use of ether. Drainage from the peritoneal sac has not been as profuse or prolonged where ether was used; these features for betterment possess the double advantage of diminishing the necessity for frequent change of dressings and obviating prolonged stay in the hospital.

In conclusion the following is submitted for your consideration:

1. That the local use of ether in peritonitis has been clearly proven clinically to be of material benefit in making for the well being and recovery of the patient.
2. That ether may be safely used in peritonitis.
3. That the quantity to be used must be regulated to suit the age of the patient.
4. That the toxicity of ether when used intraperitoneally is slight.
5. That ether produces a certain degree of immunity from the ravages of toxemia for a few hours following its introduction into the peritoneal cavity which may turn the scales in favor of the patient's recovery.

1606 FREEMAN AVE.

LIQUID AIR AND ELECTROLYTIC OXYGEN FOR ANESTHETIC PURPOSES.*

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The increasing demand for oxygen in connection with various anesthetic agents, rescue work of various kinds as well as its use in the treatment of disease, makes it imperative that we should look carefully to our oxygen supply as to its purity.

The ever increasing price of oxygen for medicinal purposes, the increasing supply for commercial purposes with the great variation in cost, have led some of us to do a little thinking which has resulted in articles being prepared, read and published; and when we read in these articles that oxygen sells from $1.50 to $50 per hundred cubic feet we wonder where we are and when the game is going to stop. A saving of $48.50 on 100 cubic feet or about 700 gallons of oxygen is an item that most of us can not afford to overlook.

Before we proceed to buy a cheap oxygen for medicinal purposes let us go a step farther and investigate the reason for the variation in price.

The advent of welding by the oxy-hydrogen and oxy-acetylene processes made the production of oxygen a commercial problem and we know that meant an oxygen produced at a cost that could be used at a profit.

Oxygen generation is of three classes, chemical, electrolytic and atmospheric, to each of which except the second there are subdivisions.

The chemical oxygen can not be produced at a

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profit for commercial purposes; this is not true of electrolytic and atmospheric methods.

Can commercial oxygen be used for medical purposes?

This is the question that confronts us and the answer will give us some information as to the great difference in cost that we note in some of the articles that are published.

We will first consider chemical oxygen. The most common chemical process is the dry evolution of oxygen under the influence of heat from a mixture of 100 parts by weight of crystallized chlorate of potash and 13 parts of manganese dioxid, contained in a sealed retort. The gas requires thorough washing in a solution of caustic soda to eliminate its chlorin. The fault with most chemical processes is the difficulty of eliminating the poisonous chlorin.

Electrolytic oxygen is produced by a group of oxy-hydrogen generators, each an electrolytic cell through which, by the passing of an electric current, water containing some alkali is decomposed. The oxygen collects at the positive electrode and the hydrogen at the negative electrode.

The two gases, as they collect on their respective electrodes, are effectively separated, and the bubbles rising as they collect are entrapped in compartments. The gases pass into pipe lines and thence into gas holders. A compressor removes the gases from the holders and pumps them into cylinders.

The impurity in electrolytic oxygen is hydrogen.

Atmospheric oxygen is produced by various methods, those in use in America are the Linde or German method and the Claude or French method.

The air is compressed to a liquid, then submitted to a process of rectification at the same time that an almost complete transference of heat is obtained from the compressed air entering the apparatus to the liquid air thus formed. The air is compressed by a four-stage compressor and after each stage the heat of compression is removed by passing the air through a cooler, through which water is circulated. The carbon dioxid and moisture in the air are readily eliminated by freezing and the oxygen becomes liquid while the nitrogen is still gaseous.

This explains in brief the principle of the separation of the gases.

The impurity in atmospheric oxygen is nitrogen.

We find the impurities to be hydrogen in electrolytic oxygen and nitrogen in liquid air and both hydrogen and nitrogen are inert gases and are harmless in the quantities in which they are found, but we must not jump at the conclusion that we can go to any plant producing commercial oxygen and procure our supply without first ascertaining if the plant is prepared to furnish oxygen in cylinders that are used only for medicinal purposes, as cylinders that are used for commercial purposes may at some time have been used for other gases that would render the oxygen unfit for medicinal purposes.

Again proper precautions may not have been taken in the production of the gas, while it would not injure it for commercial use, would render it unfit for our work.

Any commercial plant can be equipped to produce oxygen for medical use, but it will have to add the cost of equipment and analysis to insure to the consumer a pure gas, just the same as we demand chemically pure drugs and would not use a commercial article for medical purposes.

We must also remember that the price of commercial oxygen that is quoted as 2 cents a cubic foot or 2/7 cents a gallon means at the plant and does not take into consideration the added expense of drayage, freight and middleman.

Those of us that are fortunate enough to live near a commercial plant that will produce an oxygen that will come up to the following requirements will greatly reduce the cost and have an article that is safe for internal use.

Standards of purity recommended by Charles Baskerville and Reston Stevenson for oxygen to be used in the machine:

The gas should be neutral toward moist delicate litmus paper; and when passed through an aqueous solution of silver nitrate it should produce no turbidity. Not more than an opalescence should be produced when two liters of the gas are passed slowly through an aqueous solution of barium hydroxid. When five liters of the gas are passed slowly through an aqueous solution of sodium hydroxid, then over heated copper oxid, and finally through an aqueous solution of barium hydroxid, no turbidity should be produced. The gas should contain at least 94 per cent. oxygen upon the dry basis. As supplied for use, the gas should contain no liquids and no solids.

55 S. William St.

IF YOU DESIRE TO RESPOND TO THE CALL TO THE COLORS AND JOIN THE MEDICAL RESERVE CORPS, THE EDITOR OF THE SUPPLEMENT WILL COOPERATE WITH YOU IN SECURING A COMMISSION AND WILL ENDEAVOR TO SECURE YOU SUCH SERVICE AS WILL ENABLE YOU TO FOLLOW YOUR SPECIALTY. IF YOU CANNOT SERVE, PERSONALLY, PERSUADE SOME OTHER ANESTHETIST TO JOIN.

EXCITATION AND DEPRESSION OF THE NERVOUS SYSTEM IN SHOCK.*

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Never did it so much demand courage to discuss the shock problem in reference to the central nervous system as at present. Yet I shall make it my thesis that on the relationship of the nervous system to the remainder of the organism there can be founded a generalization which will embrace all forms of the shock symptom-complex. One is only made bold by the fact that the relative dominance of the nervous system, the first idea in priority, enunciated by Travers in 1827, while frequently in the hospital, has never been in the graveyard.

How broad the primary basis of generalization must be there is no need to emphasize. It is only arbitrarily that the symptom-complex of surgical, traumatic shock has by its frequency and severity and the busy attention of the surgeon become a standard. The very use of the term shock in allied states demonstrates a greater or less unity or kinship. Anesthetic shock and emotional shock are familiar examples; anaphylactic shock is more recently recognized as a cousin; and as a product of the great war there comes to the fore shell shock, old as a symptom-complex, but new in its special etiology through natural paths of special sense, not before so familiar to us. For all of these, and likewise for a multitude of other bodily states, admittedly overlapping the domain of shock, of which syncope, collapse, hemorrhage, sunstroke and drug effects are the most fully recognized examples, a community can be traced through the primary or secondary cellular reactions of the nervous system.

My investigations have not been on shock as a problem by itself. I have no prejudice of specializing in its field. It is true that my first cystological work was on material from experimental shock, but it soon became apparent that the real problem was that of the relation of the nerve cell to its environment, both internal and external, a problem in short of fundamental functional reactions. It is from the knowledge gained of these from all sources that the application to shock is made.

That the shock problem is primarily a nervous problem might seem to rest sufficiently on the fullness of knowledge that the nervous system is the medium of interrelationship between body and environment, and the chief agent of the body's own regulative and adaptive mechanism. If any one doubts the sufficiency of that statement, shock as a nervous problem so rests because of the biologic attribute of differentiation. The nerve cell is specialized for irritability. Since it is totally irritable, no environmental change which touches that body can escape it, through direct or indirect ways. The habit is to think in terms of the limited and specific mechanism of body function. The cytologist sees more that is not translated into outward expression, because it is not conducted over specific paths. To say that motor cells are seriously involved in shock will probably meet unbelief, though muscular weakness is recognized.

Certain physiologists particularly seem to think that such changes of irritability are escaped easily enough. They not only deny fatigue to the nerve cell, but the implication is that in reflex action the rule of the neuron is merely a matter of conduction. For fatigue there is the positive evidence of objective change from the microscope, even if that fatigue does not display itself in a physiological experiment of considerable duration. The explanations of relative indefatigability are: *First,* because of the degree of differentiation as a nerve cell—the more primitive the greater the endurance; *second,* because of the abundance, and hence the reserve of cells; *third,* because of the wonderful dynamic reserve of the individual cell, again all objective evidence.

For the role of the neuron it is not only the transmitter of energy, but the energizer itself, the sole conceivable source of nervous energy. This energy is in tangible potential form, as witnesses the behavior of the nuclear chromatin, has limits, and is dissipated—hence the fatigue. The nerve cell is a self-charging storage battery, but in a continuous discharge the upbuilding from food synthesis can not keep pace.

It is the disregard of functional energy which is partly responsible for the way critics dismiss the cytological interpretation. They say the changes are the result of shock, not involved in causation—did he not find them in hemorrhage? The nervous system can be the butt of impulses; what gives them force is a mystery beside the question to the critic. The changes to be discussed include not only reaction but action. I am fighting for the every day activities of the nerve cell. The nervous system must be an energic sharer in every phenomenon of shock, even when it does not initiate it, in the same way it is in normal physiological interactions, otherwise the organism would not be an organism.

The emphasis on this is because in my opinion the one thing that is muddling progress in shock

*Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917. From the Pathological Laboratory of the University of Missouri.

today is the perverted notion of minimizing or denying the nervous side of it. It does not follow that the nervous side is all-inclusive. The nervous system only shares according to its specialized cooperative place in the organism. There is not the slightest conflict that from the particular environmental changes which produce the particular state of shock, there result as well reactions independent of the nervous system, perhaps local, perhaps constitutional. Thus acapnia and acidosis may occur as collateral processes under the conditions necessary, which it is for special physiology to determine. Or in a skin burn there is not only the direct shocking effect on the nervous system, but a general toxemia with its reaction on all systems, not only the nervous, but, for example, the urinary. The resulting cloudy swelling of the kidneys gives its own symptoms, but further complicates the nervous reaction through retained poisons. Or in fat embolism, there are both the respiratory and circulatory effects, and their reactive effect on the nervous system which produces symptoms common to shock.

Proceeding now from the proposition that the phenomena of shock must emanate from and react upon the nervous system, the fundamental reactions of that system will be considered. These are very simple. The specialized dynamic property of the nerve cell is irritability, and the reactions are an exhibition of this property. Irritability for its display demands external influences. It can thus be increased or diminished. So without the cell there is the stimulus, within the reacting irritable substance. So variant in quantity and quality are stimuli that the stimulus can only be defined in Verworn's terms as "Every alteration in external vital conditions." It follows, therefore, from the constitution of the irritable substance and its relation to the stimulus that there are just two possibilities of internal cellular reaction, excitation and depression, and stimuli are either excitant or depressant.

These are no theoretical fancies. Physiology has produced this knowledge, and cytology not only confirms but adds to it. Not only would stimuli have been eventually so classified by experimental anatomy, but cytology goes physiology one better by offering the mechanism of the reaction of irritability and the sources of energy of the reaction. Experiment with what stimuli you will, mechanical, chemical, thermal, trophic, electrical, and the anatomic reaction is either excitation or depression. There are no changes in nerve cells other than from these processes—unless you hit them with a hammer. They cover all reactions, whether under normal or abnormal conditions. It complicates problems though it does not disturb principles that there is an intermediate group of stimuli which first excite, then later depress. Ether is an example which will make that clear. Shock then must be analyzed in terms of excitation or depression or both.

The finer analysis of the reaction to the stimulus is not within the scope of this paper. It is enough to say that the reaction of the nerve cell is sufficiently demonstrated to be a quantitative reaction. Being a reaction only of quantity, it is clear why the artificial, the abnormal stimulus, if it passes the threshold, produces the same effect as the normal one. The reaction is limited by the capacity of the irritable substance.

The anatomic basis of an experimental shock of traumatic origin may now be examined to see how it correlates with these principles. One finds primarily a state of functional excitation corresponding within certain well-defined variations to the degree of shock. A few cells are exhausted, denuded of chromatin, fewer and fewer cells are in rest, and between these extremes there are all stages of dynamic reaction. What is the physiological parallel? Mechanical stimulation of the wounding and handling is driving the cells through their stages of activity. The full series is activity, fatigue and finally exhaustion. But note that the whole process has been equally emphasized, not the exhaustion end. The sum total of activity of an organ that is always active is appreciably greater. It is most unfortunate that certain deductions have been rather limited to exhaustion, obviously not with correctness either in physiology or cytology. Absolute functional exhaustion, namely of all cells, I have never seen and never will see within the capacity of life of the organism.

Such processes, orderly though they are in the part of the nervous system affected, can not proceed without reaction on other parts and on the rest of the body. Hence they bring in their own complications, even if the original genesis is a single condition as trauma. The effects of such complications are best known by making them separate objects of study. The symptom-complex early ceases to be a matter of excitation, but depression is superimposed. Two factors will be used in example. Taking the fact that the blood pressure begins to decline, without worrying about its mechanism, the progressive cerebral anemia produces depression in its diminished food, lack of oxygen, and excess of waste. Depression produces decline of capacity of the vaso-motor center, decline of capacity of that center greater depression—a vicious circle. Or the ether factor is one of the quickest agents found in producing organic depression. Depression, an or-

ganic state with just as definite a series of changes as its quantitative opposite, activity, is just beginning to come into its own.

So a most complicated and variant state ensues in any case of experimental and clinical shock. Antagonistic factors they are in respect to activity, intensifying in respect to fatigue. On their special interplay, determined by the conditions in each case, the symptomatology depends.

Explanation of individual symptoms belongs more in the physiologic field, but one illustration will be given of how cytology clears up apparent discrepancies. For years a wordy battle has raged, those on the one side maintaining that the vaso-motor center is active throughout shock, those on the other asserting a fatigue, even unfortunately an exhaustion of that center.

What are the deductions from cytologic principles? There is some place for everybody. The vaso-motor center is a medullary center, and hence of a relatively low order of differentiation as compared with a cortical cell. It is consequently relatively more insusceptible to fatigue. The cytologist would expect, under its continuous excitation to function, an initial overactivity, followed by a stubborn maintenance of control, so that perhaps an absolute loss of irritability would not be apparent even within the limits of viability of the whole organism. Is not this in correspondence with the phenomena reported of vaso-constriction, of an irritable center up to death? On the other hand, its resistance to organic fatigue is quite another thing from an indefatigability. Fatigued the medullary cell can be, like all nerve cells, however remote the culmination of the continued process of exhaustion. Hence the claim of this side of the controversy must qualify that of the other. One can plainly see here one of the factors leading to the low blood-pressure-depression vicious circle.

So much must suffice for standard traumatic shock. Where now do the allied states, frequently set apart as pseudo-shock or shocklike, belong with reference to fundamental reactions? They involve the nervous system under the same limitations of capacity of the irritable substance to excitation and depression. Anesthetic shock, with an etiologic factor which is an initial excitant but an essential depressant, is different merely in its combination of excitation and depression. The roaring of bursting shells, auditory stimuli beyond description, excite an irritable substance already harried by trench life and drive it to fatigue. The mystery is not in shell shock, it is in the endurance and adaptive power of the mechanism. Hemorrhage, like ether, rests upon an anatomic basis which is concrete. The same initial excitation and predominant depression, in its peculiar combinations, explain why it is like and yet unlike traumatic shock. For syncope, an example: the distended urinary bladder is emptied, the abdominal vessels mechanically fill, cerebral anemia results, the individual faints; the genetic factor, alteration in vital conditions, the effect, cerebral depression. Shall I dare to include emotional shock, which the heritage of superstition and ignorance yet tends to place in the brain but not of it, contrary to our law of the cell? The same mechanism is involved whether the pupil dilates, the face blanches, the heart's beat accelerates, or is suddenly inhibited from fear or from mechanical stimuli. Fear and the shock of fear must result also from stimuli working through irritability to excitation or depression. For diseases, rabies, tetanus, diphtheria and certain pyogenic infections, which have been studied, are varied enough types to show that there is an anatomic basis in the nervous system only of excitation or depression. The so-called degenerations are simply end phases of these processes.

From the nervous analysis then a definition seems safe. It does not ignore the relation of other body systems, for much evidence could be adduced that the basis of all body function is irritability. All organs must be affected by environmental change as their specific irritability permits. Shock can only be most generally defined as a phase of a universal relation between organism and environment: The disturbances in the bodily state which result from the concatenated processes of stimulation. Stimulation is the technical term which includes both excitation and depression, though too frequently applied to excitation alone. Shock is no specific state. The word should be a generic term for the sum total of variant states, even if technical usage continues its more restricted application. The vulgar usage is the correct one; the shock of operation, of injury, of fear, of hemorrhage, of vomiting, of disease. All kinds are included in the definition. That every degree is included is as important. Minimal degrees are not sufficiently recognized. Unless the patient blows up after operation, surgeon and anesthetist are inclined to congratulate themselves that he is as good as before. There are the same processes tending the same way in the patient who has stood the strain better. Heat is a condition of life; a rise of temperature produces an excitation, excessive heat superimposes a depression. Is the combined end result in prostration, the "sun stroke," the only effect that need concern us?

There only remains to discuss as briefly as pos-

sible the end results of shock. These are both immediate and remote. The immediate end result of excitation is exhaustion. When enough individual units are exhausted the nerve center or part is incapable of function. On the other hand, when depression becomes absolute total incapacity for function results. The two processes, diametrically opposite though they are, end in a common functional incapacity. These principles are well enough known, in physiology as well as cytology, only they have not been sufficiently applied. If there is complete constitutional prostration from the environmental reactions considered, medical men are prone to use the descriptive term collapse. In their writings, however, they are more uncertain. Some consider it identical with severe shock; others by arbitrarily electing to classify it under special genetic factors, like loss of blood, or body fluid, or poisons, or disease, provide themselves with a working distinction to start, through later somewhat vague as to why it does not continue to separate itself more plainly. The fact is, whatever the final state of shock, however induced, it is to be referred to the sum total of functional incapacity which is the end result of processes of excitation and depression. Let that be the definition of collapse, and retain it as a good descriptive term.

But there are also remote effects of stimulation. Excitation and depression, whether too severe or too long continued, end eventually, each by its own process, in senile change. No presumptive effect is this, but anatomical fact, each process differentiated by its own peculiar atrophy of form and loss of specific substance and bearing up to cell death its quantitative distinction. For a natural life, the wearing out of the nervous system is at some time inevitable. The price of activity is age; sooner or later the usury is greater than the substratum can synthesize. Shock, with its rude intensifying of the same processes, tends the same way, aids in hastening the event. The how of the mechanism is perfectly clear. Artificial stimuli, unusual stimuli, abnormal stimuli, all affect the irritable substance alike in a quantitative reaction; the same end must follow. Can one ignore the experimental fact that in a puppy at one year, with only a puppy's endurance, a most profound shocking operation leaves after a year's recovery a cell effect not distinguishable from a naturally senile dog of fifteen years? On the other hand, the reserve power in cells, the reserve cells, the regrowth which is recuperation, while they fool us as to the effect produced, conserve life for the organism. While I am not prepared to refer them to this or that part of the nervous system, or to this or that alteration, there is a wide enough basis in such permanent cell changes for the so-called traumatic neuroses, whatever that word means. Surely not all are imaginary or counterfeit.

This is the cytologic analysis of shock, and it is believed only a beginning of a greater knowledge. But the cytological analysis can not be an end of the shock problem. It is merely a foundation for physiological and clinical analysis. Yet the cytologist may from his point of view venture to suggest that the prime need now is for the study of stimuli, first of their excitations and depressions kept separate from each other, then of their interactions, with the resulting inhibitions and summations. The physiological chapter will be largely written in terms of inhibition and summation.

The analysis does not smooth the road for the clinician. It does rather the contrary in its present state. It does make clear, however, that no one method of treatment can be applied to all possible forms of shock, or even to all phases of any particular form, and explains past failures. A predominant depression would seem to demand a different handling from an essential excitation, alike though their end effects are. Even if the latest suggested measures should be uniformly successful in overcoming the splanchnic engorgement, the fatigue or depression of the nervous system, though benefited by the normal medium, are states which would have to pursue their tedious course to recovery. Even here though the reserve and adaptive power might attest me on the looks of things a poor guesser, to put it mildly.

With fuller understanding of the permutations and combinations of stimulation of organic function, there is hope of progress. The results will necessarily be conditioned by the inevitableness of the processes under excessive or continuously acting agencies and by the primary state of the patient. But the methods of controlling the liability of protoplasm are surely not exhausted.

It sums it all up that the phenomena of shock are phenomena of the irritability of protoplasm, of which the accumulated knowledge began with Francis Glisson in 1672.

UNIVERSITY OF MISSOURI.

YOUR FELLOW ANESTHETISTS ARE IN SERVICE AT THE FRONT AND IN THE TRAINING CAMPS. REMEMBER THEM WITH FREQUENT LETTERS AND OCCASIONAL GIFTS. THEIR WORK IS ARDUOUS, DANGEROUS AND LONESOME. SHOW THEM THAT IT IS APPRECIATED BY THOSE AT HOME. SEND THEM GOOD-CHEER AND COMFORTS.

SOME OBSERVATIONS ON THE CAUSES OF POSTOPERATIVE NEPHRITIS.*

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The subject of the rôle of infection in nephritis is not a new one; on the contrary, the literature accumulated is very voluminous. But a study of any series of routine urine examinations in relation to the individual case as it may be followed through under hospital observation gives rise to many new problems. Since the majority of cases coming under our observation are surgical, we became interested in the relative importance of ether anesthesia and focal infection with regard to postoperative nephritis.

In looking through the literature concerning postoperative nephritis we were astonished not only at the lack of definite knowledge on the subject but at the contradictory statements emanating from authorities of equal standing, few of whom offer any experimental data for their observations. It has long been the prevailing opinion among a large per cent. of the medical profession that ether anesthesia has been the prime offender. I have felt for some time from an empirical observation of several thousand surgical anesthesias that the importance of ether as a causative factor had been greatly exaggerated. In conjuction with Dr. Scott Edwards, critical studies of five hundred cases were made with this point in view.

Gwathmey, in his book on anesthesia, gives nothing definite with regard to the effect of ether on the renal tissue. Gröndahl, studying the effect of ether upon the kidneys, found in seventy-five ether narcoses, where the urine had been examined before the narcosis, albumin present in twenty-seven cases, always associated with cylinders excepting in three instances. The albumin frequently did not appear until the second day and promptly subsided in the majority of cases. The high percentage of albuminuria is referred by Gröndahl to the fact that in general these patients had undergone severe and prolonged operations. Albuminuria appeared at the end of the first day in 20 per cent. of the cases, and at the end of the second day in 16 per cent. The average duration of the albuminuria was from seven to nine days. In case of repeated narcosis the albuminuria appeared after each narcosis but with diminishing severity. Ether accordingly, in Gröndahl's opinion, does not cause an intoxication nephritis.

Connell, in discussing the excretion of ether, says "ether is chiefly excreted by physical diffusion into the alveolar air, a small amount is oxidized in the body. Owing to the physical affinity for fat, the fats and lipoids tenaciously hold a trace of ether so that excretion continues on the breath for as long as thirty-six hours. Sollman (1916) in the discussion of the toxicology of ether gives the opinion that anesthetics on direct application narcotize all cells of the lower organism as well as the higher, the concentration required for irritation is greater than is reached from systemic administration, and that chloroform and ether are absorbed almost instantly from the lungs and excreted promptly and almost quantitatively by the same channel. A small part is probably excreted by the urine.

Miller and Cabot, in a series of experiments on the effects of anesthesia and operations on the kidney function, found no definite relation of the decrease of phenolsulphonephthalien excretion to postoperative albuminuria.

Honan and Hassler, in a report of three hundred and fifty cases of intravenous anesthesia in which ether was the agent used, give the urinary findings as follows: "The urinary analysis made before the operation and for three or four days afterward showed no marked differences in the specimens. The total amount was increased and specific gravity lowered during the first twenty-four hours; often the specific gravity and solid content of the urine remained unchanged. In no case, even after employing seven and five-tenths per cent. ether solution, did blood, albumin or casts appear in the urine, although German observers have reported occasional cases of transient hemiglobinuria after the use of the stronger ether mixtures.

Allen, in comparing the renal changes following operations under spinal, local and general anesthesias, states that 60 per cent. under stovain, 66 per cent. under local and 70 per cent. under general anesthesia show varying degrees of albuminuria. He quotes Hartleib as finding albumin in 78 per cent. of cases following operations under stovain.

In regard to the influence of focal infections upon the kidneys there has been some interesting work done recently. Orphuls, after the study of a thousand necropsies, concludes that not only the amyloid kidney but that subacute and chronic glomerulonephritis in the majority of cases is due to chronic sepsis, and calls attention to the probable danger in that respect of the existence of chronic local infections, such as so often are present in the accessory sinuses of the nose, throat, gall bladder and appendix.

Dick and Dick of Chicago, in the study of a series

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of cases of chronic nephritis were able to demonstrate pathogenic bacteria from the urine in every instance. They have further elaborated this by a more recent series of experiments, a report of which appears in the Archives of Internal Medicine for March, 1917. Out of the eighteen cases of chronic nephritis studied, in eight they were able conclusively to demonstrate the presence of bacteria in the urine identical to those found at the site of local infection elsewhere.

In the study of our series of cases a complete examination of the urine was made before and after operation. In as many cases as possible catheterized specimens were used. Bacteriological examinations of the urine were made in a number of cases ranging from those with mere traces of albumin to the cases showing profound kidney involvement, in all of which cases catheterized specimens only were used.

Fifty-nine and three-tenths per cent. of all cases examined before operation showed some evidence of an existing nephritis. Five and six-tenths per cent. showed albumin alone; four per cent. showed albumin and casts; thirty-two and seven-tenths per cent. showed albumin and pus cells, and seventeen per cent. showed albumin pus cells and casts. In the postoperative urines sixty-four per cent. gave evidence of kidney involvement, an increase of four and seven-tenths per cent. The majority of cases showing postoperative kidney disturbance in which the preoperative urines were normal proved to be simple cases of albuminuria, which promptly subsided in a few days. In a certain number of cases which showed evidence of kidney disturbance before operation, the urine returned to normal abruptly following the operation. By far the largest percentage of cases showed no noticeable change in the pre and postoperative findings. In a comparatively small number of cases the evidences of nephritis were increased to such an extent as to indicate an acute kidney involvement. In this group of cases, without exception, all gave preoperative evidence of nephritis. In all cases of this type we were able to isolate pathogenic bacteria. The following cases are a few representative of the series:

Case 1—Preoperative urine findings: Albumin, few pus cells, occasional granular cast. These findings persisted after keeping the patient several weeks in bed. The tonsils were removed under ether anesthesia. The specimen the following day showed an increase in albumin, pus cells, red blood cells and casts. A catheterized specimen was obtained and 2 cc. of the urine cultured in deep tubes of dextroascitic bullion. These cultures developed a streptococcus which grew in chains of ten to fourteen. This organism was subcultured on blood agar and proved to be strongly homolytic. A quarter grown rabbit was injected intravenously with the growth from 15 cc. of the bullion and died in forty-eight hours. Autopsy showed the following: Heart, large and flabby; kidneys on section showed small hemorrhagic areas throughout the cortex. The bladder was full and contained urine which showed casts, blood, pus and a high per cent. of albumin. The organism was cultured from the kidney cortex, urine and blood in the heart.

Case 2.—Preoperative urine findings: Trace of albumin and few pus cells. Operation Panhysterectomy; pathology, cystic degeneration of ovaries and fibroid of the uterus. Streptococci were cultivated from the ovaries. Postoperative urine showed an increased amount of albumin, numerous pus cells, blood cells and casts. 2 cc. of catheterized urine was planted in deep tubes of a dextrose ascitic bullion broth. The cultures developed streptococci. A quarter grown rabbit injected, with the growth from 15 cc. of the broth, intravenously, died in twenty-four hours with the following findings at autopsy: Hemorrhagic areas over lungs, liver and spleen; kidneys showed two small areas of superficial cortical infection. On section there exuded sanguinous fluid and the tissue was deeply injected. The organism was recovered from the kidney, liver and spleen. The above are two of six cases in which this procedure was followed out with similar findings.

In six cases of acute suppurative mastoiditis, all showed evidence of nephritis in the preoperative urines. On five of these the urinary findings were greatly increased during the forty-eight hours following the operation, four of them returning to normal in a few days. In one case which was operated under nitrous oxid anesthesia, the positive urinary findings persisted for four weeks. One other of the cases which showed an increased postoperative disturbance was operated under nitrous oxid anesthesia. It was of interest to note that a number of cases with prohibitive preoperative urinary findings, when placed at absolute rest in bed for a period of time ranging from one to three weeks, in the majority of instances returned to normal and showed no exacerbation of the kidney condition after operation. In one case in which the urine contained granular casts, albumin and pus cells, the patient was kept in bed for two weeks, at which time the urine became normal. The patient was then subjected to a radical breast amputation, ether anesthesia being given for two hours,

after which the urine showed absolutely no evidence of a return of the renal involvement. In a few cases in which the urinary findings diminished but did not entirely disappear after rest in bed there was apparently no change in the urine following operation. In one case, however, in which the urinary findings were reduced to a mere trace of albumin after a rest in bed of one week, the patient was subjected to an abdominal operation involving the removal of chronically infected tubes. In the following thirty-six hours an acute nephritis developed, progressing into uremia and death. In this connection the recent work of Eisendrath and Schultz along the line of lymphogenous kidney infection proves interesting. They reach the conclusion that the kidneys are prone to infection from the pelvic organs and lower urinary tract directly through the lymphatics. Such an explanation, it seems to me, would throw a great deal of light on the dreaded renal insufficiency, so often following operations on the prostate gland.

To my mind there is no doubt but that the kidneys are liable to infection through the blood and lymph streams and that such is often the case following surgical operations on infected tissues. In fact, I believe that an infection is present in the kidneys in practically every case of postoperative nephritis of marked severity or of long standing. Of course, in patients whose kidneys are normal, there are many cases of albuminuria following prolonged operations, in which there has been considerable trauma to noninfected tissue, but such cases are physiological and are of no serious consequence.

Postoperative nephritis, in my opinion, is produced by a combination of causes, among which are: the existence of a kidney already crippled by infection; an increase in waste products to be eliminated incident to operative trauma and possibly the dissolution of lipoids; a decrease in the liquid output due to a diminution(?) in the ingestion of liquids and an increased loss of fluids through the skin, lungs and intestinal tract; lessening of its eliminative power by a lowered blood pressure in the kidney itself; a lowering of the power of resistance by the loss of body heat due to prolonged anesthesia and shock and lastly the filtering of bacteria and their toxins thrown directly into the blood and lymph streams from an infected tonsil, gall bladder, appendix, prostate or a much handled colon. In comparison with infection I would come to the conclusion that the irritation of ether plays a very insignificant rôle in the production of postoperative nephritis.

Hume-Mansur Bldg.

SOME OBSERVATIONS ON POSTOPERATIVE LUNG COMPLICATIONS.*

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The frequency with which lung complications occur in the convalescent period of the surgical patient should be sufficient to keep us alert in avoiding the etiological factors in each case. It is opportune at this time of year and in this latitude that we have our attention again called to the matter, since one of the factors in the production of lung complications is exposure.

Picture to yourself the possible consequences of a case which is all too frequently repeated in many hospitals. A patient, an abdominal case, is placed upon the operating table with a pad consisting principally of rubber with a thin filling of cotton separating the bare back from the metallic top of the table. Covered with two sheets and an appropriate opening for the operative field the patient is maintained in anesthesia, attended with profuse or moderate perspiration, and further bathed along the back with fluids from the abdominal cavity or with drippings from the sponges for a period of minutes to hours in a room at 68° F. After the operation is completed the patient is placed upon a cart with a similar pad, lightly blanketed, and conducted through the corridor, which also serves as a ventilating shaft, to his room. He is now placed in a warm dry bed—if the water bottle hasn't leaked. He begins his stage of convalescence, which may be rudely interrupted by the onset of pneumonia by a fresh-air crank in charge of the case; by tight binders or unrelieved pain, which will interfere with pulmonary ventilation and expectoration.

Nor is it my intention of relieving the anesthetist of the great responsibility which he assumes in this regard. Has any one heard of an aseptic mouth? Are there any septic organisms which have not been found in the tonsils, in the pyorrhea pockets, of teeth, or in the nasal mucous? Can there be a question but that this septic material reaches the smaller branches of the bronchial tree when froth and mucous is permitted to churn back and forth from the mouth to the bronchial tree at each respiration, when it is possible to hear the gargling euphoniously named the moist rale which may also be heard over most of the chest for many hours after certain forms of anesthesia, with which we are all familiar?

While it is not the duty of the anesthetist to regulate the temperature of the operating room,

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yet he becomes a party to it if he is not conscious of a low temperature, one below 80°.

How does the anesthetist avoid responsibility and allow the patient to struggle for inhalation through mucous and a malplaced tongue? While it is doubtless true that the marked negative pressure in the alveolus assists the flow of blood from the right heart, yet an *exaggerated* negative pressure no doubt also produces an edema of the lungs, with an excessive flow of fluid into the aleveolar cavity, reducing the vital resistance of this tissue and inviting the onset of coagulation.

Homans divides these postoperative lung complications into three classes: First, those directly dependent upon the narcosis and resulting directly from the inhalation or aspiration of septic material into the lungs; second, hypostatic pneumonia depending upon feebleness of the circulation and inability to keep the lungs clear, and third, embolic cases.

It would seem, therefore, that neither the hospital nor the anesthetist shoulders the whole responsibility for postoperative lung complications. In fact, Graves is inclined to consider almost all postoperative lung complications as exacerbations of preexisting focal infection. This, of course, is the extreme view in the opposite direction. That there are embolic cases there is probably no room for doubt.

In the recent literature upon the tonsils, we find a great deal written regarding pulmonary abcess following tonsil operations; while its occurrence is infrequent, especially in private practice; yet, because it does occur, many have sought its etiology. In this field, as well as in the general surgical field, there have been two views,—the embolic view, that the blood carries the septic material from the operating field to the lungs, and the view just stated, of the aspiration of the septic material directly through the air passages to the alveoli. The latter view seems to have by far the larger number of adherents.

Again, the hypostatic pneumonia in the feeble or old patients is beyond control of the anesthetists or the hospital.

Läwen found pulmonary complications as frequent after local anesthesia in the laparotomies performed at the Leipsic clinic while Miculicz has shown that the percentage of acute pulmonary complication following operations, is relatively greater under local anesthesia than when a general anesthetic is administered.

If these observations were universally correct it would seem to relieve the anesthetist of much responsibility which now rests upon him in regard to the occurrence of this complication.

Mortimer does not consider ether, per se, as a direct cause of postoperative lung complication. Its vapor, however, is irritating and may thus act as an indirect cause, particularly if it is given freely or with too close air limitation, or when the condition of the patient, or the nature of an operation renders it unsuitable, such as in pulmonary tuberculosis. The conditions which render ether inadvisable, of themselves predisposed to pulmonary complications.

Chapman, in presenting an account of experiments upon the irritant effects of ether, concludes that ether causes a swelling of the alveoli, congestion of the alveolar tissues, and even intraalveolar hemorrhage, which increase with the length of etherization and with the amount of crowding, or forcing of the ether. We should be interested in knowing how much of this effect was produced by obstruction to the airway.

There is another lung complication which at present may be considered uncontrollable by the anesthetist, hospital or surgeon. I refer to fat embolism producing infarcts of the lungs, the symptoms which result are often so similar to pneumonia that it cannot readily be differentiated clinically. Fat embolism has been known to occur in breast amputation, abdominal and other major operations, as well as more commonly following fractures of the long bones.

Homans, collecting the statistics of 16,043 laparotomies reported from European clinics, found an average mortality due to postoperative lung complications of about 4.4 per cent.

The combined statistics of Monroe, Risley, and Graves covering 3,089 laparotomies show a mortality of 0.4 per cent. The morbidity of this Boston series was 1.8 per cent or 57 cases. There were 34 cases of pneumonia, 20 cases of bronchitis, 3 of pleurisy and 6 exacerbation, in the previously tubercular. While the discrepancy between the Boston and European series may be partly accounted for by better anesthesia, and postoperative care, undoubtedly the percentage of septic cases and the desperately ill was not so great in the American series. Armstrong attributes the greater frequency right-sided pneumonia from the invasion of septic matter from the mouth and pharynx rather than through the blood and lymph. His statistics covering 2,500 ether administrations at the Montreal General Hospital, 1902-1905, showed 55 or 2.2 per cent. with lung complications within 48 hours after anesthesia. The patients ranged from 1 to 78 years. Ether appears to have been used in certain cases

for which this anesthetic was generally regarded as unsuitable. Clover's inhaler was, as a rule, commonly employed. Of the 55 cases 70 per cent occurred in the winter months. In 37 of the 55 cases, or 75 per cent, a septic focus in some part of the body was present before the development of the lung complication.

The 55 cases comprised: 14 of lobar pneumonia, 16 of broncho pneumonia, 19 of acute bronchitis, and 6 of pleurisy. In the series there were 39 cases of trephining, 8 of which, or 20 per cent, developed lung complication, which is explained on the basis of aspiration of fluid and vomited material into the air passages. There were 952 abdominal operations, 27 of which, 2.8 per cent, developed lung complications.

Crouch and Corner analyzed the record of 3,000 administrations of ether and chloroform, and other anesthetics, at the St. Thomas Hospital, London, in 1900. Of these 3,000 cases there were at least 10 in which bronchitis and bronchial pneumonia arose within 24 hours after the administration, the patients having displayed no evidence of these conditions beforehand. In all these 10 cases ether preceded by nitrous oxid was used. The ages of the patients were from 9 to 62 years. The operations were lengthy. In 6 cases there was bronchitis, in two bronchial pneumonia, in one bronchitis and pleurisy, and in one (fatal) bronchitis, bronchial pneumonia and pleurisy.

Before the Surgical Section of the New York Academy of Medicine, April 12th, 1916, Whipple and Bancroft reviewed their experiences upon this subject in the New York Hospital. Alma Vedin, their anesthetist, has collated their results as follows: During the year 1915 there were 15 cases of pneumonia, in 1,413 operations, or 1.06 per cent. Of these 15 cases, 7 ended fatally, a mortality from pneumonia of 46.6 per cent. and a total mortality from lung complications of 1.5 per cent. Seven of these cases developed lobar pneumonia, 3 edema of the lungs, and 7 bronchial pneumonia, of whom several gave X-ray evidences of tuberculosis. Three of the fatal cases followed severe peritonitis, so that the pneumonia was probably of terminal type. The questions as to whether the bronchial pneumonias were actually such or multiple infarcts was not determined.

Beckman has recorded 6,825 operations with pulmonary complications in 87 cases, none of which, however, resulted fatally.

In the annual oration before the Medical Society of London, Pasteur quoted Bibbergeil's statistics published in 1906, in which pulmonary after-effects were noted in 7.2 per cent of 3,009 laparotomies, especially after operations on the stomach, and the records of 3,559 similar operations at the Middlesex hospital between 1906 and 1910 which showed a percentage of 566 with lung complications, and a pronounced incidences after operations on the stomach and liver.

Pasteur was among the first to hold that it was no longer tenable to attribute pulmonary after-effects mainly to general anesthesia. Pasteur considers that deflation of the lungs may be a predisposing cause of postoperative pneumonia. And in this connection Mortimer emphasizes the importance of the diaphragm in respiration and states if its movements be inhibited by the dread of pain, or hampered mechanically by bandages, the lower lobe of the lung collapses, which condition may go on to bronchial pneumonia or other form of inflammation, if the infective organism be at hand.

Mortimer further points out that the rising temperature, viscid expectoration, painful cough and breathing subside within 24 hours, unless bronchial pneumonia supervenes. It will be realized at the same time that operations in the upper abdomen are usually prolonged, more frequently associated with relative overdosage in securing an extreme degree of relaxation, and that the patient is more frequently maintained in a dorsal position for a prolonged period after the operation.

In this connection it would seem advisable to use moderate doses of morphin for the relief of pain that free respiration might be indulged and collapse of the lower lobe avoided.

SUMMARY.

In this series there were 39,438 cases, lung complications occurred in 3.03 per cent of the cases in which figures are available. There was a total mortality of 1.06 per cent. Of these lung complications 48 per cent were pneumonia, and of the pneumonia cases 48 per cent were fatal. In one of the series 70 per cent of the lung complications occurred in the 5 winter months.

CONCLUSIONS.

The frequent occurrence, 3 per cent, of postoperative lung complication should be reduced by

1. Maintaining warm operating rooms (80 degrees F.).
2. Operating table pad of non-conductor material 3″ thick and soft enough to be comfortable and warm.
3. The avoidance of drafts and provision for protecting the patient while transferring her to her room.
4. The maintenance through the entire period of anesthesia of a free air way both as regards mucous and the soft tissues.
5. The avoidance of ether in cases in which it is contra-indicated.
6. The elimination of tight binders over the diaphragm.
7. Encouragement of full breathing, which may require moderate doses of opiate to relieve pain thus caused.
8. Changes of the position in bed at frequent intervals during the first week.

COMPARATIVE DANGERS AND AVAILABILITY OF NITROUS OXID-OXYGEN ANESTHESIA.*

JOHN R. McCURDY, M. D.,
PITTSBURGH, PA.

Perhaps it were just as well at the beginning of my remarks to state that I am firmly enlisted in the ranks of nitrous oxid-oxygen advocates; that I am fully convinced that, with the best modern apparatus, in the hands of an anesthetist of experience, it is today the best anesthetic agent available. No anesthetic is safe in inexperienced hands and the best results cannot be expected without good armamentarium.

But in order to disarm any prejudice that might influence the present discourse I have approached the subject negatively, so to speak, seeking facts and testimony that tend to argue against its value and safety. Necessarily, I will be guilty of repeating many things that have been published by other contributors and investigators, but only, I trust, by those of recognized authority.

Since my subject comprehends primarily a comparison of anesthetic agents let us clearly understand what is the criterion. The vast majority of professional anesthetists will agree that the *best anesthesia* is that which is least harmful to the patient—immediately and remotely—and the *best anesthetic* the least harmful agent; for all anesthetic agents are poisons, and in some degree injurious to the economy. I say, advisedly, the majority of anesthetists, for there are all too many surgeons who consider that anesthesia best which will enable them to operate with ease and convenience and in the shortest possible time, sublimely indifferent to any injury done the patient.

What are the dangers of anesthesia? The gravest one, and the only one considered by the laity and by some operators, is *death during administration.* How, then, are we to compare nitrous oxid-oxygen with other agents in this regard? You answer by quoting from your favorite statistician the number of deaths per thousand administrations of *gas,* ether, and chloroform. Personally, I attach very little importance to anesthesia *statistics.*

MORTALITY.

Mortality statistics, as usually published, are unreliable evidence, because they are enumerations, compiled from bald records at scores of distant sources, of deaths occurring under this or that anesthetic, *assuming* that these deaths were *caused by* the specified anesthetic agent. How many of them are due solely or in part to unskillful surgery; to surgical accidents; to faulty technique; to lowered resistance; previous shock or moribund condition of the patient can never be known. We all know that many *so-called anesthetic deaths* are partly or wholly due to other causes and conversely many postoperative deaths are credited to various other causes which are at least partly due to the anesthetic. We need not suspect the honesty of statisticians or of anesthetists who report their results. But unquestionably the personal element, together with the impossibility of obtaining exact detailed information of every administration of a comparable number of cases of the different anesthetics to be compared, render statistics inaccurate. But if you accept the evidence of statistics alone as conclusive the case of nitrous oxid-oxygen is won at the start, for all authoritative statistics show it to be responsible for the lowest mortality rate and therefore the *safest.*

It would be a useless waste of time for me to quote at length published statistics of the many reliable investigators to which you can all refer at your leisure. The statistical work of Miller in The Year Book (1915-16) is perhaps the most exhaustive and reliable, as well as the most recent authority on the subject. From it we learn that the approximate relative mortality under various anesthetics is about as follows:

Nitrous oxid-oxygen: 1 in 13,000 to 35,000.
(*If dental administrations are included, and the use of nitrous oxid alone and with air, the rate is as low as* 1 *in* 1,000,000.)
Ether: 1 in 4,500 to 55,000 (average 1 in 8,010).
Chloroform: 1 in 1,300 to 3,200 (average 1 in 2,665).
Ethyl Chlorid: 1 in 1,800 to 13,300.
Spinal Anesthesia: 1 in 158 to 800.

Our discussion has to do, of course, with nitrous oxid-oxygen anesthesia. The day of nitrous oxid alone is past except for very brief anesthesia or analgesia. Pure nitrous oxid—and it is only in quite recent years that chemically pure nitrous oxid, free from poisonous by-products, has been obtainable—pure nitrous oxid without oxygen, or even with uncertain quantities of air, is undoubtedly a dangerous drug. Yet Frederic Hewitt in 1907, after careful search of both medical and dental literature covering a period of 40 years (1860-1900) and personal inquiries in addition, was able to collect records of *only 30 fatalities,* and himself classifies 10 of these as doubtfully or not at all due to the anesthetic. He further asserts "It is now universally admitted that nitrous oxid is the safest general anesthetic known when administered with a proper percentage of oxygen . . . its inhalation is practically free from risk to life. Even when pure nitrous oxid is given by one familiar with its use

*Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917.

the risk to life is so slight as to be almost negligible. So far as the author is aware no fatality has yet (1906) been recorded under nitrous oxid and oxygen." Such testimony by one of the leading authorities of the world must certainly carry weight. But is it not reasonable to believe that in the past ten years nitrous oxid-oxygen anesthesia has been rendered still more free from risk by improved methods of manufacture and vastly improved apparatus? It is a lamentable fact, however, that a considerable number of fatalities under nitrous oxid-oxygen have been reported in the past few years and some of us may know of others that have not been reported. Why is this? The gas itself as produced today by reliable manufacturers is surely not less pure than the product of ten or fifteen years ago and apparatus is far better. The reason may be found in an article by Gwathmey in the *British Medical Journal* of March 24, 1917. He says ". . . while the latest available statistics give first place, as regards life, to nitrous oxid-oxygen, yet so many deaths have been reported from time to time, *since the more general use* of this combination that we are forced to the conclusion that it is not as safe as is generally supposed, *at least with our present methods of administration.*" I do not think that the usual proper methods of administration as understood today by competent anesthetists are at fault. But the recognition by surgeons in recent years—through their own investigations and their education by anesthetists and *not* through advertising—of the superior value of this anesthetic has led them to become perhaps overenthusiastic and to place it in the hands of untrained anesthetists who have administered it with overconfidence and even recklessness. Another mistake that has no doubt led to fatal results is the *pushing* or forcing the gas in the effort to secure greater relaxation by deeper anesthesia. Nitrous oxid-oxygen has its limitations as does any other anesthetic and these must be respected. The admixture of oxygen must be constant and in sufficient percentage—be it 4 or 24 per cent.—to prevent jactitation and cyanosis beyond a slight purple or rose color.

Granting that the physiology and pharmacology of nitrous oxid is still *sub judice,* the fact obtains that death is apparently due to asphyxia or a physiological complex that is indistinguishable from asphyxia, and this can be prevented by sufficient oxygen and free unobstructed respiration.

RESPIRATORY SYSTEM.

Asphyxia, therefore, if you will allow the term, may be classed as the chief danger referable to the respiratory system. The other anesthetic which may be compared in this respect is ethyl-chlorid, which may cause death by spasm of the respiratory and laryngeal muscles, although there is here the coincident element of heart paralysis which does not pertain to nitrous oxid-oxygen. The effect in both is due to overdosage plus faulty ventilation. The one other prominent respiratory danger with all inhalation anesthetics is postoperative pneumonitis, inflammatory, tubercular, or pneumococcic. This sequella has for years been persistently blamed on the anesthetic, especially ether, and the term *ether pneumonia* is still frequently heard. Ether vapor is of course more irritating to mucous membranes than any other anesthetic and when applied continuously for an hour or more tends to break down the defense of these tissues. Chloroform and ethyl chlorid do less harm in this respect and nitrous oxid-oxygen least of all. Postoperative lung troubles occur after all anesthetics, even spinal. The anesthetic acts only as a contributory factor in the lowered resistance and disturbed metabolism resulting from the whole operative procedure. It is my firm belief that a very large majority of postoperative pneumonias are entirely due to careless nursing and exposure.

CIRCULATORY SYSTEM.

With reference to the circulatory system the effects of various anesthetics which may be immediately or remotely dangerous have to do chiefly with the heart and blood pressure. In regard to effects upon the heart muscle and its nervous mechanism, nitrous oxid-oxygen is indisputably the least injurious. Heart complications are conspicuous by their absence and at no time, even in four or five hours continuous gas anesthesia, do we see the violent stimulation of early-stage ether, followed later by rapid, thready pulse; the alarming depression of chloroform or the heightened pulse pressure of ethyl chlorid.

Changes in blood pressure, or what is more significant, as pointed out by Drs. Moots and McKesson, in pressure ratio, are universal effects of all anesthetic agents when exhibited to the point of complete anesthesia. Under nitrous oxid-oxygen properly administered the variation in pressure ratio is so slight as to be scarcely perceptible and indeed is frequently such as to be beneficial rather than otherwise. A preexisting hypertension, particularly when accompanied by arterio-sclerosis, is commonly stated as a contraindication to nitrous oxid-oxygen. This does not seem to be supported by clinical reports nor by my own experience. In a large general surgical clinic I am called upon to anesthetize a considerable number of patients with hypertrophy of the prostate for the two-stage suprapubic prostatectomy. As a class they are poor anesthetic risks, especially for ether, a large percentage of them be-

ing past middle life, having increased blood pressure, various degrees of arterio-sclerosis and bad kidney conditions. Nitrous oxid-oxygen is undoubtedly the anesthetic of choice for them and I have yet to see any change in blood pressure sufficient to cause the least apprehension, the variation, if any, being transient. Compare this absence of one very important element of danger with the persistent, progressive and protracted hypotension under third-stage ether; the even greater depression of spinal anesthesia and the sudden alarming fall under chloroform. As asphyxial hypertension may often be seen in a poorly managed gas anesthesia due to insufficient admixture of oxygen or obstructed air passages. But this is the fault of of the anesthetist, not the anesthetic.

Concerning the changes in character and constituents of the blood under different anesthetics the researches of Dr. Theodore Castro, of Dr. Crile and others seem to indicate that whatever changes occur in coagulability, hemoglobin content, cell relations and morphology, hemolysis or acidity are more or less transient and do not constitute elements of especial danger. But they prove that all such blood effects are far less marked and less enduring from under nitrous oxid-oxygen than other anesthetics. This is particularly marked in comparison with ether, which produces a leucopenia and reduction of hemoglobin that often persists for days.

GLANDULAR SYSTEM.

Time will not permit us to discuss in detail the comparative effects of the different agents on liver, kidneys and the endocrin glands. But published researches satisfactorily prove that deleterious effects of nitrous oxid-oxygen are either nil or transient and constitute neither immediate nor remote dangers to the patient, the normal or preanesthetic functioning of all organs becoming reestablished within a few minutes or an hour after the anesthetic is removed. Is not this a most vital element in the problem of recovery from operative shock? Again, in the much-discussed field of acidosis, while it is not claimed that nitrous oxid-oxygen anesthesia is never contributory to this postoperative complication, it is certainly associated with far less acidosis, if any, than other general anesthetic agents. Metabolism is only transiently, if at all disturbed, as also the phagocytic power of the blood. The effect of ether, on the contrary, is such that the patient's opsonic index is not restored to its preoperative level for from two to five days or longer. This feature of nitrous oxid-oxygen anesthesia renders it particularly available in septic cases, anemias, chronic debilitated patients and tuberculosis. These latter considerations, together with its prompt and complete elimination, the absence of appreciable injury to any cells of the body, the vastly better psychical condition and the ability of the patient to resume nourishment early, certainly reduce postoperative dangers to the minimum.

INDICATIONS AND LIMITATIONS.

One of the chief arguments for the safety of nitrous oxid-oxygen and its value to the surgical profession lies in the fact that, in the presence of what may be classed as *grave surgical risks*, severe infections, pathologic and symptomatic anemias, traumatic shock, acute pulmonary affections, and moribund conditions, the *surgeon* chooses this anesthetic *because it will do his patient less harm*, immediately and remotely, than any other general anesthetic. He may elect to operate under local anesthesia if possible or under intraspinous injection in a few cases; but when all other general anesthetics are contraindicated he will call for *gas*. All authorities agree that nitrous oxid-oxygen is the choice for minor operations and cases of short duration, the only objection offered being its high cost. This latter consideration should be unworthy of the careful surgeon, for the welfare of his patient should certainly not rest on the question of an added expense of two or three dollars per hour of operating time. Moreover, if the patient or friends are consulted and the advantages of quick, comfortable induction, absence of choking and smothering sensations, prompt recovery without nausea and vomiting, and greater safety explained to them they will scarcely ever hesitate to assume the slight additional expense.

In enumerating its pathologic contraindications authors are accustomed to mention chiefly the following: (1) Respiratory obstructions, such as very large tonsils, tumor or cellulitis of neck, emphysema, empyema. (2) Pronounced arterio-sclerosis or atheroma. (3) High blood pressure. (5) Aneurism. (5) Dilated or *fatty* heart or uncompensated valvular lesions. I have mentioned these in the order of their importance. But as I have already asserted the dangers during administration of nitrous oxid-oxygen are almost all predicated on the occurrence of asphyxia, which by skillful administration can always be avoided. Excluding this possible element of danger the above contraindications are no more potent with nitrous oxid-oxygen than any other general anesthetic.

The field of abdominal surgery embraces a comparative and reasonable objection to this form of anesthesia in the feature of insufficient muscular relaxation. Beyond question nitrous oxid *per se* does

not completely relax the musculature and herein lies one of its chief elements of safety, for the preservation of muscle tone is a very important desideratum throughout the entire surgical procedure. Several anesthetists have asserted that they are able to secure any necessary abdominal relaxation with nitrous oxid-oxygen. But their technic usually embraces the employment of adjuvant agents plus the intelligent cooperation of the surgeon. By conscientious and studious team work of surgeon and anesthetist beautiful results are possible.

Abdominal surgery can be and is being done with entire satisfaction under nitrous oxid-oxygen anesthesia; but if the surgeon demands absolute relaxation or *dish-rag* anesthesia, if I may term it such, without supplementary anesthetics and conscientious team-work, both surgeon and anesthesists are alike frequently doomed to disappointment. Outside the abdominal field there are limitations to the availability of nitrous oxid-oxygen from the operative standpoint, not as to safety in general. Nose and throat operations as well as brain surgery may be better accomplished under ether-vapor insufflation, the former because of the difficulty in maintaining an even plane of anesthesia and the latter because of greater congestion of the peripheral circulation under nitrous oxid-oxygen.

As to age limitations there need be practically none in the hands of a skilled anesthetist. Very young children are said to be bad risks for *gas* anesthesia because of their greater liability to asphyxia. This disadvantage is offset, however, by the fact that complete anesthesia can be maintained in children with a very small volume of nitrous oxid and a correspondingly higher percentage of oxygen. My own experience has embraced patients from six months to eighty-four years of age.

The large field of anesthesia for dentistry and oral surgery I leave to the specialist in that branch of the profession, offering, in passing, my opinion that the management of successful and satisfactory nitrous oxid-oxygen anesthesia for oral procedures is a more difficult matter than for major surgery, mainly because of the necessarily attendant irregular breathing, the limitations of the upright posture, the difficulty of regulating the mixture of gases on account of air dilution by mouth breathing, especially during the nasal technic of administration. Of its value as an analgesic and anesthetic in their specialty the most experienced dental surgeons and anesthetists preponderantly testify.

In closing I shall mention one other field in which nitrous oxid-oxygen analgesia and anesthesia is eminently available and should, I believe, supplant all other anesthetics. This is the field of obstetrics. Its quick and pleasant induction, its rapid elimination, its comparative absence of immediate or remote danger to mother or child, and its really efficient relief of pain, even in the form of analgesia, render nitrous oxid-oxygen the anesthetic of choice in normal lovor labor and operative obstetrics. It has the very great advantage over morphin-scopolamin amnesia of being under the prompt and absolute control of the anesthetist and obstetrician.

WEST PENNSYLVANIA HOSPITAL.

VAPOR ANESTHESIA.*

JOHN J. BUETTNER, M.D.
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The first account of vapor anesthesia was by Junker, in the *Medical Times and Gazette,* November 30, 1867. Valuable as this method is, it, like all other anesthetic methods, was apparently anesthetized for many years. As would be expected, Junker's apparatus had its faults, in consequence of which fatalities ensued. The afferent and efferent tubes were connected improperly or the Junker bottle was tilted. The result was that liquid anesthetic, in place of vapor, was delivered to the patient. It is with some pride, however, that, even at those times, were found anesthetic enthusiasts, who brought forth modifications of the Junker apparatus to remedy the existing defects and faults.

Chloroform is the only anesthetic mentioned in connection with the Junker and, later, the Clover and Harcourt outfits. The prejudice against chloroform was as strong then as now. While the great value of vapor anesthesia, especially for nose, throat, and mouth work, was recognized, no one had used ether in this way. Clover, in 1877, demonstrated the advantage of ether vapor, especially when warm. It is quite interesting, in looking up anesthetic history, to notice the various outfits and modifications that have been devised for vapor anesthesia. The first real valuable and popular apparatus was the well-known Gwathmey three-bottle arrangement.

It might be well to specify that in this paper the designation *vapor anesthesia* implies that form of anesthesia that depends on force from behind to convey it to the patient. It might perhaps be better to follow the suggestion made by Coburn, in the *New York Medical Journal* of June 1, 1912, and call it *insufflation anesthesia.*

While vapor anesthesia has its most extended use in nose, throat and mouth operations, it is also of great help in all types of surgical operations. The force from behind is variable. Hand bellows were first used, then foot bellows, heat, and connection with an oxygen tank or with an electric blower. While these have all been quite successful, the most commendable one is the oxygen tank. Gwathmey, in his text-book on Anesthesia, and in an article in the *Medical Record,* November, 1904, has conclusively proven, experimentally and by clinical observations, *that oxygen increases the safety of all anesthetics, without decreasing their anesthetic effect.*

*Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917.

Andrews, of Chicago, in 1868 announced the advantage of oxygen in connection with nitrous oxid. Hewitt, in his admirable work, explained the advantage of oxygen over air with nitrous oxid.

Today, there is absolutely no question or doubt in regard to the value of using oxygen in connection with nitrous oxid,—in fact, with some there is a grave question as to whether one is justified in using nitrous oxid without oxygen, even in short operations. Neudörfer, of Vienna, in 1886 introduced the use of oxygen with chloroform. Bertel stated, before the St. Petersburg Medical Society, that a more rapid and successful anesthesia, practically free from danger, was obtained with oxygen and chloroform.

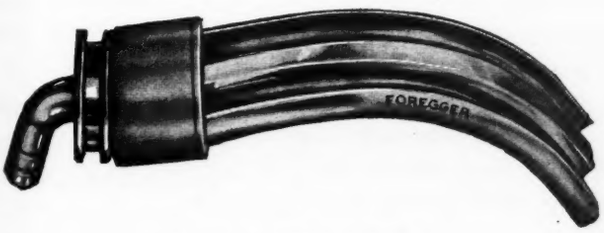

Figure 1. Buettner Airway.

We all know that asphyxia is produced, not altogether by excess of carbon dioxid, but by lack of oxygen. Irregular breathing may be due to lack of oxygen. How often have we, in watching the induction of anesthesia, seen the patient fight, choke, and become cyanotic; all, or in great part, at least, due to lack of oxygen. The patient's fight is justifiable and might properly be termed one of self-preservation. There is no doubt, also, that the attitude and personality of the anesthetist is also a very great factor in the smooth and successful induction of anesthesia. Too little attention is given to psychology and its relationship to anesthesia.

The writer has had considerable experience with vapor anesthesia, first with the Junker apparatus, later the Gwathmey three-bottle arrangement. For the past few years I have used the Autogenor. In this apparatus oxygen is generated by the contact of water upon fused cakes of sodium peroxid. This is, also, a three-bottle arrangement—one for water, one for ether, and the third for either ether or chloroform. The generator and bottles are encased in an asbestos jacket to retain heat, which is created in generating the oxygen. While the advantage of heating the anesthetic vapors is still a matter of controversy, there is no contraindication, to my knowledge, unless the vapors are heated too much. The heating of the anesthetic vapor, however, is not the redeeming feature of this apparatus, but, rather, the fact that pure oxygen is present at all times.

The method which I have found most satisfactory, especially for nose, throat, mouth, and eye operations, is as follows:

I use a Lumbard mask, upon which I always drop some cologne or essence of bitter orange. This mask is connected with the autogenor, and the oxygen started at once. Anesthol, which is a chemical union of ether, chloroform, and ethyl chlorid, is used by the drop method to induce anesthesia.

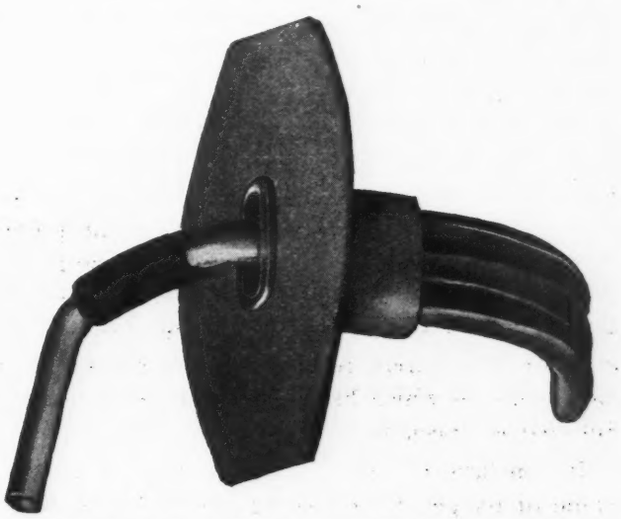

Figure 2. Buettner Airway arranged for Oral Anesthesia.

While not unmindful of the great prejudice against chloroform or any combination with chloroform, I have had very happy experiences with it. The experience of others, according to all reports, who use chloroform and oxygen has also been very satisfactory. There is no doubt but that the anesthetist, rather than the chloroform, is the offender in many cases.

Anesthol is dropped slowly on the mask until the irritating effects on the respiratory mucous membrane are passed, when ether is turned on from the autogenor. The ether-oxygen is then continued until full surgical anesthesia is secured. In throat and mouth cases, the mouth gag is now applied and the anesthetic vapor continued, either with crooked mouth tube or nasal tubes.

I might add that the use of an aspirator in this kind of work is of marked benefit to patient, surgeon and anesthetist, in maintaining a clear operative field and patent airway.

In work on nose or eye, where a general anesthetic is given, I use an airway anesthetic mouth tube after the patient is fully anesthetized. The patient should always be fully anesthetized before an airway tube is inserted. This tube holds the tongue forward, furnishes an airway, and has a tube for anesthetic vapor. The tube is easily sterilized and with its use the anesthetist is not in the surgeon's way.

When using vapor anesthesia for general surgery I use a modified Lumbard mask with a rubber-face cushion. This furnishes a larger space for re-breathing than the regular mask, and then the anesthetic vapor is less irritating, due to the point of entrance of the vapor being further removed from patient's face.

The induction, with this method, has been most pleasant, the color and respiration being good at all times. The awakening comes almost as soon as with gas-oxygen and is usually with a smile. The after-effects are usually nil, due, no doubt, to the use of oxygen. Several authorities have testified to the lack of nausea in cases where oxygen has been used in connection with the anesthetic. The majority of cases have had no preliminary medication. One other factor that contributes to the well-being of the patient, postoperatively, is the proper preliminary preparation of the patient. Fortunately, there is great cooperation at present between the surgeon and the anesthetist, and the anesthetist is gradually, but surely, reaching that position in medical science to which he is justly entitled, that of a full-fledged specialist.

In conclusion, I wish to lay special stress on the value of oxygen in connection with all anesthetics. By its more frequent use we will be able to have a smoother induction, a safer conduction, and a more rapid recovery.

In the issue of the *Journal of A. M. A.*, October 6, 1917, there is a very interesting article by Dr. S. J. Meltzer, entitled "The Therapeutic Value of Oral Rhythmic Insufflation of Oxygen," with description of a simple apparatus for its administration. In resuscitation and in treating *gassed* patients this method gives promise of clinical results.

1208 So. SALINA ST.

THE ASSOCIATIONS OF ANESTHETISTS ARE CONSTANTLY STRIVING TO IMPROVE THE SPECIALTY OF ANESTHESIA AND CONSERVE THE STATUS OF THE ANESTHETIST. MEMBERSHIP IS A SINE QUA NON TO SUCCESS. NEXT IN IMPORTANCE TO BEING AN ACTIVE MEMBER IN THE ASSOCIATIONS IS ENOUGH INTEREST IN THEIR WELFARE TO BRING IN NEW MEMBERS. DO NOT HESITATE TO ADVISE YOUR FELLOW ANESTHETISTS TO JOIN. IT WILL REPAY THEM.

ANESTHESIA.*

GEORGE K. DICKINSON, M. D.
JERSEY CITY, N. J.

It gives me great pleasure indeed to come here and talk to this body of surgeons, men who are in active emergency work, when almost all of my work is elective, and to bring to you some ideas. But I got one idea from you this morning which I hope I will never forget, and be able, Mr. President and Dr. Chaffee, to hand down to the young surgeon as I meet him from time to time in the hospital, and that is, "Weed Your Garden." It would make a mighty good paraphrase. If Dr. Chaffee hadn't been weeding his garden all his life, this association wouldn't be twenty-six years old, because I know the story of the association. And it is the man who weeds his garden that gets to success, and it is the weeds that we come here to dig out. Dr. Cavana dug out one to-day. I wish we could all go into our gardens and remember that nature cures—for we fool around and so prevent nature from curing, in a general way—interfere.

Another weed in the garden is anesthesia, ignorantly and carelessly given. And that is the one thing that interests me in my little paper. And if I tell the truth in it, and I hope I do, or if there is not truth in it, I want your discussion. It will perhaps help you to do something for your profession and for your patients by seeing that anesthesia is properly given. And if you don't do it the legislature is going to, and you know how clumsy the legislature is.

The danger, discomfort and distress of anesthesia are quite co-equal with major surgery. Operations through simplicity of technic and anesthesia "without tangible misfortune" have produced a type of "jitney" surgery which delights the tyro and pleases the whim of many.

Before the time of narcosis such surgery was done as was imperative. People were strapped to a table, some laudanum given, and quickly the work was over, hemorrhage staunched and the wound allowed to heal as best it might. Pain and danger suggested surgery. Danger and pain followed.

Then in quick succession, as though Providence willed it, there were three discoveries. The practical and surgical application of narcotic substances which had been used as toys previously. The bacillary cause of wound infection, and Lister's pronouncement as to antisepsis. One without the other would have made surgery incomplete. The three together have been the foundation on which a

* Read before the meeting of the New York and New England Association of Railway Surgeons.

rational scientific and much safer surgery has been developed.

In the history of anesthesia is seen a repetition of that so often noted. As Farraday discovered electricity and Edison developed it, as Henry of Princeton discovered telegraphy and Morse gave it to the public, so Long of Georgia in 1915 used ether in surgical work, but failed to inform the profession, and Morton of the Massachusetts General Hospital publicly exploited it in 1846.

Then in rapid succession chloroform was introduced by Simpson in 1847, and somewhat before that nitrous oxid was demonstrated by Wells.

Big truths forcibly presented, even though they may meet and relieve conditions long deplorable, always excite prejudice. In the medical profession there are those who are held back by what we call conservatism. They become obstructionists, and fail to give proper impetus because of narrow sight. Amongst the laity, religious beliefs and a too material interpretation of the Bible has stayed the hand of science and scientific advancement.

So ether and its associated narcotics were attacked. Churches preached against them as being contrary to the laws of God and nature. Legislatures and the public forum did what they could to handicap these wonderful friends of the afflicted. And prejudice is not dead to-day.

In a short time deaths commenced to occur—a type of death which had not been noted without the anesthetic—and, naturally, these were laid to the effect of the narcotic. This perturbed and led to an endeavor to find some drug which would blank the mind, suppress the sense of pain and not have a toxic effect upon the system. Numerous substances were discovered and exploited and many methods of narcosis devised. Statistics have been compiled, but through ignorance of the action of narcotic agents, through the impurities which they contain, and, perhaps more than all, through the personal equation of the man administering the anesthetic, these have proved futile. Then again, climate and time of year have a marked influence.

A chemically pure anesthetic, one which has not been adulterated in the making, or which has not been decomposed by time, air or sunlight, whether chloroform, ether or nitrous oxid, is the only anesthetic to be used.

On being inhaled the first effect is upon the respiratory passages. Ether is a powerful stimulant to these organs during the early stage of administration, increasing the rate of inspiration. Evaporating rapidly if given by the open method (which is the most common), the inspired air will be thirty to forty degrees cooler than the air of the room. Deep inspirations will often carry down into the alveoli some part of each individual inspiration. The effect of the anesthetic being irritant, we find the so-called "death space," that is, between the mouth and the larynx, becomes swollen and secretes a quantity of mucous and saliva, which from experiments with colored particles are frequently seen to be drawn down by the deeper inspirations into the depths of the lung and even into the alveoli. The bronchial tree itself has its epithelia chilled, becomes congested and in numerous cases, if not in every one, petechial hemorrhages are found in the bronchial ramifications, or even in the alveoli.

Every prolonged ether narcosis is followed by small pneumonic foci in the lungs with mucous and extravasated blood cells in the alveoli, and some round cell infiltration. In the predisposed or susceptible this may occur after a shorter operation. With chloroform, which is less irritating and does not produce as cold a vapor on inhalation, these same lung changes are found to a less degree.

The anesthetic forms unstable compounds with the proteids of the blood. The narcotic action is dependent upon a solubility in the blood, stability of that combination and rapidity of penetration of the cells of the body, particularly of the lipoids of the nervous tissue. This combination in the blood is not a chemical one.

The objective effect of a narcotic as seen by the surgeon is that of slumber, but it must be remembered that while the narcotic agent is acting upon the nervous tissue, it is at the same time having some effect more or less deleterious to other tissues of the body, and according to concentration to the duration of anesthesia, and to the metabolic sensitiveness of the different tissues of the body to the agent do we have primary or secondary tissue disturbances.

Let it be understood that with all anesthetics and with every body anesthesia is a toxic process. Fortunately, nature's recuperative powers are so sufficient that damage done to the respiratory tract, the glandular organs and to the brain by the anesthetic is generally followed by complete repair.

Whether ether or chloroform be given some degeneration of the cells of the liver, kidney and tissues of the heart occurs, although to a much minor degree with ether than with chloroform. In the body ether splits up into substances which are not foreign to it, while chloroform splits up into chlorin bodies which are intensely toxic. Particularly is this the case if the anesthetic is given in a room where gas is burning.

The toxic effect of ether is generally exerted on the respiratory system, inducing pulmonary edema,

postoperative pneumonia, or upon the renal, inducing fulminating nephritis, all of which occur immediately after operation. The effects of chloroform are more prone to be metabolic, degeneration in the glandular organs are sustained, and may not produce their symptoms or demonstrate their dangers for several days.

From one and both we have developed in those who are susceptible that mysterious phenomenon known as acidosis. Acids being formed in the liver or elsewhere which act on the bicarbonate in the blood, the carrier for carbonic acid, eliminating it through the urine, thereby blocking the cells of the tissues of the body by preventing an elimination of the carbonic acid.

The effect of ether upon the heart, as well as that of chloroform, is two-fold: a reflex effect through the irritation of the so-called "death space" and the tissue effect. Ether is largely a stimulant to heart action, increasing its rate, rhythm, and apparently its tonicity, for sometimes murmurs heard before the anesthetic disappear with anesthesia. The effect of ether upon the vasomotor apparatus is stimulating, as arterial pressure will rise and be maintained at a proper level for a considerable time. Chloroform, on the contrary, depresses heart action, lowers blood pressure and is a direct arterio-capillary sedative. Those who operate upon the brain will turn from ether to chloroform, if they find much oozing, in order to depress circulation and make the operation easier.

In giving the anesthetic three things must be considered and kept in mind: we must have a mental picture of exactly what is or may be going on in the air passages, in the glandular organs of the body and in the brain while we are narcotizing each individual case. We must know our patient (and this can only be obtained by a preliminary study of the person by physical examination and study of the disease or lesion to be operated for; and, lastly and important, the potential value of the carbonic acid on the system.

Our methods of anesthesia should depend upon the possibility of damage not only of the anesthetic or the way it is given, but also upon the personality of the one giving it. The method which is best, most comfortable and safest, unfortunately, is one which should be confined to the specialist. We have no "jitneys" in anesthesia yet. No quick, rapid transit, safety last methods which are safe. The young man, the interne, the occasional administrator of an anesthetic, should confine himself to that which is the simplest, because in his hands it will be the safest.

If the day ever comes when no one shall be allowed by law to give an anesthetic until he has been to a school, studied and practiced under a competent specialist, then we can say to the interne that there shall be but one method, which, as we see things nowadays, is the combination of gas, oxygen and ether. Gas is practically non-toxic. Oxygen prevents over-carbonization; that is, suffocation of tissues, and a little ether renders a stability to the narcotic phenomenon.

But until such time as the ideal can be reached we must depend upon some method which can be put in the hands of the novice and the casual administrator. According to clinical experience, the solution is perhaps ether by the open method: according to the reports of experimental surgery, some method by means of which there may be a certain amount of re-breathing of carbonic acid would meet indications.

As has been said before, statistics are of little value because there are so many things entering into the phenomenon of anesthesia: personal, chemical, and metabolic, that this question cannot be answered by them.

We do know that carbonic acid is an important hormone to the body. Unstriated muscle fibre, cardio-vascular, intestinal, as well as the function of the medullary centres, and the brain itself depend upon carbonic acid. Any method which eliminates it too rapidly from a tissue or tissues will lead to disturbances more or less grave.

Too great a stimulation of the inspiratory centre by ether may produce acapnea sufficient to kill. If one will but watch the anesthetist he will note that even though open anesthesia is taught by good surgeons to be the safest and best, the tendency is to throw towels around the gauze and to limit the intake so that now we seldom see anything but a modified open method.

Experience has led all anesthetists to precede every narcosis by an injection of morphin-atropin. The reasons are, the patient comes into the operating room more composed and tranquil, the induction period is shortened, excitement is lessened and perhaps eliminated, more profound anesthesia is obtained with greater relaxation, hypersecretion of mucous and cardio-inhibitory shock are prevented, and, as none of the narcotics employed are ideal, none are without danger, any method which will tend to lessen the amount given adds to safety.

Not only should responsibility to the anesthetist begin before the operation and demand his constant and intelligent attention during it, but he and the surgeon should outline the subsequent care in all distinctness and detail. At no time until recuperation is complete from the combination of the anes-

thetic and morphin should the patient be left to himself. When placed in bed, with pillows under the head and shoulders (if there be no shock), the respiratory tract is elevated, breathing made easier and nausea and vomiting less common.

The typical place to put a patient would be in the open. The next best is in a room with the windows widely open so that the breeze may blow over the face, stimulating the respiratory centres, producing a sense of comfort, and facilitating the discharge of the anesthetic from the lungs. But the patient should be well clothed, covered and tucked in. The feet and knees should be kept warm so that there may be no possibility of chill.

During this stage of recuperation, even though it be lengthy, no effort should be made to arouse, no unnecessary touching of the body or face, no calling by name, or endeavor to obtain attention. The longer one sleeps after anesthesia the better and quicker the resolution. Relatives, friends and those curious should be kept from the room. The nurse and the nurse only should be there.

The main object of this paper, however, is to emphasize the fact that with each and every anesthesia a pathology is instituted, which pathology may in many instances become progressive and lead to distress or dangerous conditions.

A single leper is such a horrible sight that even though he is known not to be more dangerous than a syphilitic, communities will build hospitals and spend an unusual amount of money upon him, while the spitting tuberculous, spreading the disease amongst children, find it difficult to obtain proper accommodation. All because we *see* the leprosy and *do not see* the tuberculosis.

So it is with anesthesia. If we could but see the internal organs straining under the anesthetic perhaps we would feel a greater responsibility.

IF YOU HAVE NOT ALREADY AVAILED YOURSELF OF THE OPPORTUNITY OF SECURING A COPY OF THE AMERICAN YEAR-BOOK OF ANESTHESIA & ANALGESIA YOU SHOULD DO SO AT ONCE. THE FIRST EDITION, INCORPORATING ALL THE ADVANCES IN THESE SUBJECTS FOR 1915-1916 IS BEING RAPIDLY EXHAUSTED. SUCCEEDING VOLUMES WILL BECOME A CUMULATIVE ENCYCLOPEDIA AND YOU WILL NOT WANT TO BE WITHOUT THE INITIAL VOLUME. THE MOST OUTSTANDING AUTHORITIES HAVE CONTRIBUTED THEIR MOST IMPORTANT RESEARCHES.

THE PLACE OF LOCAL ANESTHESIA IN SURGERY.*

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Mr. President and Gentlemen: I think that we are to be congratulated on having the subject introduced by such a sane and sensible paper as Dr. Dickenson has just given on the principles which should govern our choice in the use of anesthetics. I don't think one could very well disagree with anything he said.

I am to speak about local anesthesia, which under some circumstances is valuable.

Whenever we speak and write about local anesthesia, it does not behoove us to forget that general anesthesia, and by general anesthesia I mean ether given by an expert, and experts, I believe, have to be born and then finished by training (for you cannot train a man born without that particular tact and sensitiveness which are essential to the job to make a good anesthetist), is the best anesthesia for the routine of the clinic and in the majority of cases. Faddists on local anesthesia are just as ridiculous as faddists on pacifism or any other line, and make themselves ridiculous to the discerning by the time they waste out of a busy morning by interrupting their operations to inject novocain, and sometimes subjecting themselves to the annoyance of operating upon a groaning, struggling patient.

In spite of the great and remarkable life-saving nature of local anesthesia in a large number of cases in which it is an invaluable resource, we cannot deny it certain disadvantages, although by modern technic it has been amazingly perfected and its usefulness correspondingly extended. In the field of surgery, local anesthesia saves us from the embarrassment of having to render our patient unconscious and later sick at the stomach for the removal of a wen or some such trivial procedure; saves him from the necessity of employing an additional assistant (the anesthetist), and us of having to nurse and entertain our seasick patient in the office or hospital until he recovers from the effects of the anesthetic. The minor operations may be done quickly, simply and comfortably, and the patient may walk home at once.

Familiarity with the technic of local anesthesia is for these cases of the greatest value both to the surgeon and to his patient. Here the advantages entirely and unquestionably outweigh the disadvantages.

From its application in minor surgery, many sur-

* Read before the meeting of the New York and New England Association of Railway Surgeons.

geons have extended the field of local anesthesia as the method of choice to many of the operations of major surgery; hernia, for instance. Now, in many patients herniæ may be done very satisfactorily under local anesthesia; but I have noticed many times in many clinics that when operating before an audience, a surgeon—even a skilful one—gets many a grunt and squirm from his patient during the operation, and especially in patients of a nervous temperament, has to put up with constant conversation and interruptions, not always couched in respectful language. I would infinitely rather do an ordinary hernia under local anesthesia than under ether given by a poor anesthetist, as nothing is more disconcerting than constant worry about the patient's condition; but when we can command the services of a skilled anesthetist, why not put our patient to sleep and enjoy the comfort of performing the operation in freedom from interruption and worry; and the blessed privilege of attending strictly to the task in hand?

In certain cases of hernia, however—I mean strangulated hernia, particularly those in which obstruction has resulted in periodical vomiting, often fecal—general anesthesia, even in skilled hands, is an additional danger; vomitus may be inhaled. Under these circumstances, the advantages of local anesthesia greatly outweigh the disadvantages, and by putting up with slight delay and annoyance we may complete our operation with much greater safety to our patient. After we have carefully infiltrated the tissues and opened up the ring, it is not necessary to anesthetize the intestine, which is not provided with special sensory nerves, and may be cut, clamped and cauterized with impunity. Pulling on the mesentery is painful, but with a little care to avoid this we can get through these procedures very satisfactorily and put our patient to bed in excellent condition, untroubled by nausea or mucous secretion in the pharynx, which are inseparable from ether. I have been able to make many resections of the intestine in this way without difficulty. In hernia we are not bothered by that spasm of the muscles of the abdominal wall which makes the performance of other laparotomies under local anesthesia difficult. Any operator of experience knows the value of muscular relaxation in abdominal surgery, and will be unwilling to forego it without reason. This reason alone is sufficient to make ether the anesthetic of choice for laparotomies, pelvic and otherwise; but under certain circumstances even these operations may be done to advantage under local. I have resected the cecum and terminal ileum for cancer, and performed the necessary anastamosis in a woman of 76 with chronic bronchitis without the slightest difficulty and with the happiest result.

My colleague, Dr. J. C. Hubbard, performed a Cesarian section under local in a woman with diabetes, without shock or difficulty, and mother and child recovered. The baby did not have to be resuscitated, either. We have come to regard diabetes, especially if acetonuria is present, as an absolute contraindication to ether, after losing a patient from acetonuria. He began to vomit everything and became prostrated, and perished in seventy-two hours after a quick and simple thigh amputation. In his case we employed an anesthetist skilled in giving gas, and gas and oxygen was supposed to be the anesthetic. When the patient struggled a little in the middle of the operation, a few whiffs of ether were given, with the above result.

By the way, by using novocain, a circular infiltration of the thigh may be done, the sciatic nerve injected, and amputation of the thigh easily gotten away with in these cases. Bier's intravenous novocain is a good resource in operations on the knee and lower leg.

Some one now asks, "Why not use spinal anesthesia in these cases, with its simple and rapid technic and satisfactory anesthesia?"

The reason is that when tropacocain is used and given by the most skilful, a patient occasionally collapses and even dies. Employing spinal anesthesia in an old woman with an intestinal obstruction from cancer and a chronic bronchitis—the patient sitting up to have the anesthetic given, of course—I had the horror of seeing her jaw drop, lips turn white and pulse disappear. It was not considered safe to let her lie down for five minutes for fear the fluid would run up along the canal, and we had to hold her through that length of time. After those awful five minutes we put her down and elevated the legs, and her pulse came back and we finished the operation. As far as my sensations were concerned, she might as well have died. I thought she had. Every now and then some one does die from spinal anesthesia, and on the table. If patients are going to die at all I wish they wouldn't die on the table; it is so hard to explain to the family. So I for one am willing to take a lot of trouble to avoid spinal anesthesia.

Even prostates may be done under local. The two-stage operation is employed. The suprapubic incision is easily done under local, and the enucleation under the excellent anesthesia furnished by injecting the terminal filaments of the cauda equina

through the last sacral foramen: the so-called sacral anesthesia. This is an excellent resource in hemorrhoids and stricture, when for any reason general anesthesia is dangerous or inconvenient.

In operations about the mouth and pharynx the intratracheal tube and intrapharyngeal method have so extended the range of the general anesthetic that local anesthesia is rarely needed; but when it is needed it is perfectly surprising what one can do with it. These miracles are accomplished by the combination of regional anesthesia by the injection of novocain into the second or third division of the fifth nerve at the base of the skull, and local infiltration. I inject them according to Levy and Beaudoin's method, the same that we employ for alcohol injections in trifacial neuralgia.

I suppose you are familiar with the pictures in Braun's work on local anesthesia of patients sitting up and conversing quietly while half the upper jaw is being removed, or some such matter. When I saw the picture I hardly believed it possible, but it can be done. I have with the utmost satisfaction and with almost entire freedom from pain removed half the lower jaw, portions of the tongue and lower lip and the submaxillary, salivary and lymph glands by this method. One aged and arteriosclerotic patient died of pneumonia three days after the removal of half the tongue. If a general anesthetic had been employed this death would have been attributed to that.

It is in operations for goitre that, to my mind, local anesthesia has found its most important field. Simple cysts and adenomata of the thyroid may be removed with the greatest facility under simple novocain infiltration, and I believe that this is the best way to do them. The occasional respiratory difficulties connected with ether in cases where the trachea is deformed and flattened are thus avoided. Intratracheal ether is, of course, to be employed if general anesthesia is to be used at all in thyroid cases; but the local anesthesia is so satisfactory that even in nervous patients it is the method of choice. In the exophthalmic cases, morphin and a little scopolamin given beforehand in carefully graded doses will put the patient into a sleepy, stupid condition, such that simple novocain infiltration is enough to keep him quiet even during a long and difficult operation. These nervous patients have such irritable stomachs that the avoidance of postanesthetic vomiting is of the greatest importance. They are often asleep at the end of a long, hard operation for goitre, and the pulse does not go so high, nor the patients get into that dangerously irritable, nervous, jerky condition that they do under local anesthesia alone; *i.e.*, without the morphin and scopolamin. I am a firm believer in local anesthesia in operations for goitre.

Another class of case in which local anesthesia has been found invaluable is in resection of the ribs in empyema. These patients are septic, weak and sick. Sometimes the cavity connects with a bronchus, and there is danger under a general anesthesia of pus running up into the bronchus on the other side. In rib resection under novocain, the skin and subcutaneous tissues are infiltrated and divided, and then the intercostal muscles, periosteum and parietal pleura. If this is thoroughly done, the rib cutting does not cause pain. The patient's coughing at once aids in the expansion of the lung. There is no waiting for them to come out of ether before the lung can expand and allow the drainage to be adjusted. In abscess of the lung, extensive exploration of the chest has been successfully carried out and two or three ribs resected and drainage put in without the slightest shock or rise in pulse on the part of the patient; and this in a patient pale, weak and septic, and coughing up dirty, grey, mucopus, full of detritus and fragments of lung tissue. A general anesthetic would have unquestionably increased the danger and difficulties of the operation. In a case of bronchectasis, the contrast was presented between two attempted operations under ether—which had to be abandoned because the patient became black in the face and was threatened with drowning in her own pus—and the resection of three ribs along a length of six inches under local anesthesia. Who uses a general anesthetic for any form of suppuration in the thoracic cavity is to my mind subjecting his patient to unnecessary difficulty and danger.

Local anesthesia may be well used for operations on the brain in which diabetes, disease of the lungs or other conditions contraindicate general anesthesia. The section of the bone here is not unduly painful, as is the case in rib resection.

I am sure to be asked why I do not use the anoci-association of Crile. For the following reasons: In abdominal operations where I have employed it, generally a little ether has had to be added to the gas and oxygen mixture the patient is inhaling in order to overcome muscular spasm, and I have taken the time and trouble necessary for infiltration and have not avoided ether after all.

In operations for vascular conditions, such as goitre, there is always a little mucous congestion with increased venous hemorrhage, very troublesome in these cases. Also I do not get rid of the troublesome presence of the anesthetist and his mask close to the field of operation. I will admit that sometimes a little gas has to be given during

the deeper dissection of a goitre when the local for some reason is insufficient, but it is only for a few minutes and is not very bothersome.

The infiltration of the skin and subcutaneous tissues in goitre facilitates the dissection of the skin flaps by increasing the interval between the skin and fascia, and if a little adrenalin be added, greatly decreases hemorrhage from the smaller arteries and vessels.

If general anethesia is to be employed at all in these cases I greatly prefer intratracheal anesthesia.

In the majority of other conditions, for reasons similar to those given above, I prefer to have recourse either to simple local anesthesia, without the addition of gas and oxygen, or else to general anesthesia with ether. Gas and oxygen are often given as a preliminary to ether, in order to save time in getting the patient under.

In tracheotomies for obstructive conditions in the trachea and bronchi, local anesthesia works like a charm and is a great contribution to ease and safety.

There is one class of minor operations in which I prefer general anesthesia to local and that is delicate plastic operations about the eyelids, etc., where the infiltration so blows up and stiffens the tissues that the flaps cannot be easily manipulated or delicately adjusted so as to get the best results.

Finally, in children who are easily frightened and do not cooperate with the surgeon, the field of local anesthesia is much smaller than in adults.

ANESTHESIA IN THE SURGERY OF EPILEPSY AND IN THE CONTROL OF STATUS EPILEPTICUS.*

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Surgery as a therapeutic aid is as necessary in the epileptic as it is in his non-epileptic brother, and therefore we have to consider the use of some anesthetic or anesthetics to assist us in such surgery. This class of patient is subject to the same variety of physical ills as is his normal brother, and he requires similar surgery for the relief of these. He is the victim of appendiceal troubles, gall-bladder disturbances, intestinal conditions demanding surgical therapy, fractures, and the full list of surgical disorders requiring operative interference. He is, as a result of his disease, subject, more so than his normal brother, to injuries of all kinds, and only in special institutions, where every effort is made to carefully supervise the patient's daily régime, is there any lessening of this risk, and even there, we find a multiplicity of injuries, ranging from a slight lacerated wound to cranial fractures. Following intensive medical treatment, there are various metabolic disturbance, which at times necessitate surgical therapy. As a therapeutic measure, surgery in the treatment of epilepsy has been practiced since the earliest recognition of the disease, and the unfortunate sufferer from epilepsy has been the prey of the surgeon since the earliest times.

A varied list of operative procedures have been in vogue with the surgeon at one time or another, and there are but few epileptics who have not at one time or another during their epileptic life been referred to the surgeon, who fortunately has been able to see the futility of many of the operative procedures which have been recommended.

As for the anesthetic to be used in operations performed upon the epileptic, we believe this to be a matter for individual choice, and as indicated by the condition of the patient. We have used both chloroform and ether in our surgery at the Craig Colony for Epileptics, and our experience has taught us that ether, by the drop method, is very well borne by the epileptic, and the greater number of our anesthesias have been obtained with this agent and method. Chloroform has been used largely in any operative work about the head, and in children, we have found this to be most satisfactory. For the reduction of dislocations, the opening of abcesses, and other work requiring only a short period of anesthesia, we have used the so-called Ether-Rausch. The induction by this method is most rapid and there is a very quick recovery. We have seen no ill results follow upon the use of the method.

In our dealings with this class of unfortunates, we have a peculiar type of mental make-up to deal with, ranging from that of the mentally normal to the egocentric and downward to the imbecile, and we should always keep this fact in mind. We do not find the epileptic patient to be any more difficult to handle on account of his epilepsy, *per se*, than any other class of patient. We do find, however, that the mentally-defective epileptic, not realizing the importance of fully cooperating with the surgeon and his assistants, is very difficult to handle, removing dressings and infecting wounds.

Seldom do we find there to be any increase in the frequency of the convulsive attacks after any operative procedure. On the contrary, the epileptic convulsive attacks are less frequent in their occurrence, this being due, we believe, to the better hygienic care given to the surgical cases both prior to and

*Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association at Toledo, Ohio, October 9, 10 and 11, 1917.

following any operative treatment, and not to any effect of the anesthetic.

In only one case in our series, running over a number of years, have we seen a period of mental confusion of the active type, following upon a surgical anesthesia. This occurred in a man aged forty-five years, operated upon for the relief of a large right inguinal hernia. This patient was markedly defective mentally, requiring close supervision at all times, his mental grade being that of a child of about ten years of age. Following operation, this patient had a period of active mental confusion, during which he removed the dressings from the abdomen and opened the abdominal wound, with fatal results. Other than this one case, we have seen no unfavorable results following any surgical procedure, which would be blamed to the fact that the patient was epileptic.

It has not been noticed that the period of induction of the anesthetic state has been increased, and neither is it the rule for us to see a convulsive attack occurring during the period of induction. In the hands of a competent anesthetist we find the induction period to be as quiet and as peaceful as is met with in the case of the non-epileptic.

In fact, we recall but one case in which a seizure occurred during operative interference. This was in the case of a young man, on whom a fenestration of the dura was done. The operation was performed in two stages. At the first, the skin incision was made, after which trephine openings, the latter being connected with a Gigli saw. The wound was then closed and the second operation done about ten days later. At this time, the osteoplastic flap is turned back, and a fenestration of the dura made. At the time of the second operation, while the patient was under light chloroform anesthesia, and the skin wound was being reopened, a mild or incomplete convulsive attack occurred, but all convulsive movements ceased when the anesthetic was pushed to the physiological limit.

It should be remembered here, that all of our anesthesias have been induced with one anesthetic, the one agent being used throughout the operation

We have used local anesthesia for various operations, both minor and major, including operations upon the abdomen, such as hernias and appendectomies, and have seen no convulsive attacks occur at such times. This may have been due to some psychic influence, or it may have been purely a matter of luck with us.

In the treatment of that condition known as Status Epilepticus and Serial Seizures, we have to resort to some anesthetic in order to control the frequently recurring convulsive attacks. Chloroform we have found to be the most useful in our hands, and we have always endeavored to bring it into use early in the condition.

The anesthetic state is of great assistance in the treatment of Status and Serial Epilepsy in that it allows of time for other methods of treatment to be carried out, such as the use of colonic irrigations, lumbar puncture, and the administration of Chloral and Bromides per rectum. We have not hesitated to use chloroform frequently in any single case, but ether we have been somewhat fearful of owing to the possibility of increasing the ever-present pulmonary edema.

Finally, we wish to make a plea for the epileptic, and would suggest that no operative procedure, when necessary, be delayed or abandoned, owing to the fact that he or she suffers from a convulsive disorder. With the assistance of a competent anesthetist in the operating room, and the tact and good judgment of an intelligent nurse at the bedside, we feel that the epileptic will be found to be a far more amenable patient to handle than he is generally thought to be.

Conclusions.

1. The epileptic, *per se*, is a good anesthetic risk.
2. Convulsive attacks are not met with when ether or chloroform is used to the surgical limit.
3. Chloroform is a valuable aid in the treatment of Status Epilepticus, and should be used early in the condition, so that other therapeutic measures can be instituted.

SOME OBSERVATIONS ON THE USE OF ETHER-OIL COLONIC ANESTHESIA.*

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It is not my intention to discuss this very important method of anesthesia as an expert anesthetist, but rather from the viewpoint of a surgeon. Dr. James T. Gwathmey of New York City must be given credit for his ingenuity and untiring energy in perfecting ether-oil-Colonic anesthesia. Since writing my last paper on this subject, which was read at a meeting of the Medical Society of Virginia in October, 1915, we have used ether-oil-colonic anesthesia in a number of cases in which we thought this special form of anesthesia was indicated. At present we are using it in all operations on the head and neck, and also in the majority of cases of tumors of the breast, especially when the

*Read during the Fifth Annual Meeting of the American Association of Anesthetists, New York City, June 2, 1917.

patient shows signs of fear and dread of the suffocating fumes of ether by inhalation. We have had occasion to operate on several patients who have had an anesthetic administered by inhalation before and often they have dreaded the anesthetic more than the operation. In these cases rectal anesthesia has been especially advantageous and it is interesting to note the comparisons of inhalation and rectal anesthesia made by these patients afterwards. I do not recall a single patient who has not made some laudatory remarks about rectal anesthesia and its superiority over inhalation anesthesia. We have used it now in about one hundred cases, and I am more thoroughly convinced than ever that it has a distinct place in the surgical clinic and a specialty of anesthesia.

In our collection of cases, four have been complete failures. The first one is recorded in my previous report of thirty-six cases. She was a girl about fifteen years of age, a moral degenerate as a consequence of a supposed fracture received in early childhood. She was naturally a very unruly person, and this combined with fright resulted in expulsion of the mixture just as fast as it was introduced. Ether by inhalation had to be given. The other three cases were young children under ten years of age. The mixture was expelled repeatedly by all three of these little patients, although it was given with a small catheter and very slowly. We have found it impossible to anesthetize children under ten years of age by this method, presumably on account of fright and lack of control. We have, therefore, abandoned its use in small children. In twenty cases ether by inhalation had to be administered to complete the surgical anesthesia, ranging in time from a minimum of one minute to a maximum of five minutes. In four cases analgesia was produced, but not complete anesthesia. One was an adeno-fibroma of the breast and the other three were recurrent cancers of the tongue or the lower jaw. In all of these cases analgesia was complete, but the patients would answer when spoken to, the operations lasting from thirty-five minutes to one hour and twenty minutes. The patients did not suffer any pain nor did they remember anything about the operation. The remaining number of our series were under full surgical anesthesia from ten to thirty minutes from the introduction of the anesthetic. I believe the number we had to supplement with general anesthesia would have been reduced if we had waited a little longer, but as a rule after a surgeon has waited about fifteen or twenty minutes for an anesthetic, the limit of his patience has been reached. Nausea and vomiting was reduced at least fifty per cent in this series and about twenty per cent had neither nausea or vomiting.

The last case of this series was a Jewess, 40 years of age, who had an epulis about the size of a hazelnut on the lower alveolar process, a little to the left of the median line. This patient was extremely nervous and apprehensive about the anesthetic. She was given the maximum dose without the slightest suspicion that she was being given the anesthetic, and was under full surgical anesthesia fifteen minutes after the second injection. The tumor with the adjacent alveolar process and upper border of the lower maxilla was removed after the tumor had been thoroughly cauterized with the Paquelin cautery. The operation was completed in thirty minutes. When the patient reacted, it was hard to make her believe she had been operated upon. She said the last thing she remembered was that she felt sleepy in her bed and when she awoke she was in the same place. She couldn't understand how or when the operation had been done. She was neither nauseated nor did she vomit, and she asked for food immediately after reacting.

The following is the technic we now employ at St. Elizabeth's Hospital:

The patient is given an ounce of castor-oil the night before operation, and saline colonic irrigation three hours before the anesthetic solution is introduced. We used to employ soap-suds enema followed by saline irrigation, but have found from experience that occasionally some of the soap-suds enema would be pocketed in the colon and interfere markedly by partially emulsifying the ether-oil mixture, thereby rendering its anesthetizing qualities less active. We are now using Lathrop's modification of Gwathmey's original technic. Two drams of paraldehyde in a mixture of three drams each of oil and ether is given per rectum; half an hour later ¼ of a grain of morphin with 1/100 of a grain of atropin is given hyperdermically; and twenty minutes later, a mixture of two ounces of ether in two ounces of oil is given per rectum in light weight patients, or in those more robust, three ounces of ether in two ounces of olive oil. This mixture is given to the patient while lying in bed on the left side in Sims' position. A small catheter, well lubricated, is introduced from three to four inches into the rectum and is attached to a funnel. The same apparatus and position is used for both the initial and last doses. We always allow from eight to ten minutes for the mixture to flow in. By doing this, there is less tendency toward cramping and expulsion. While the mixture is flowing in, the funnel is lowered repeatedly to allow the escape of gas which the mixture has replaced. Just as soon as all

of the mixture is injected, a wet towel, folded, is placed over the face to retard elimination by the lungs.

The patient is kept on the left side in bed until signs of anesthesia become apparent and is then gently lifted on a stretcher and carried to the operating room. The respirations, pulse and reflexes should be watched just as carefully as in other forms of anesthesia. If there is any cyanosis while the air passages are open, with loss of pupillary reflex, stertor or embarrassed respirations, a rectal tube should be inserted about four inches into the rectum and from one to three ounces of the mixture drawn off, the quantity depending altogether on the clearing up of the unfavorable symptoms. If the breathing is easy and regular, the circulation good, with complete relaxation and active pupillary reflexes, the patient is in surgical narcosis and the operation may be safely started.

After the operation is completed the bowel is irrigated with cold coap-suds solution until the return flow is clear. Abdominal massage is performed over the course of the colon to facilitate expulsion of the mixture. The soap-suds irrigation is used because it emulsifies the ether-oil mixture and makes it easier to wash out. Three ounces of warm olive oil are then injected and the tube withdrawn. I believe the warm olive oil injection is very important, because I have heard of several cases of proctitis following ether-oil anesthesia when the olive oil was not used. We have used it in every instance, and not a single case of proctitis or rectal discomfort has occurred in our series of one hundred cases.

The patient is carefully returned to bed in a darkened and well ventilated room. Cold saline enemas are given every four hours and abundant water is ordered. Convalescence, so far as the anesthesia is concerned, is uneventful as a rule, any number of cases having neither nausea or vomiting and when it does occur, about 50 per cent. less than by other methods.

In conclusion, my observations summed up briefly are:

(1) I do not recommend ether-oil anesthesia as a general routine anesthetic because it is a slow procedure and requires a great deal of preliminary treatment and after treatment.

(2) Colonic anesthesia has a very important place in surgery and anesthesia and distinct advantages over other methods in many operations.

(3) It is the anesthetic of choice in all head and neck operations.

(4) It is the safest anesthetic in bronchial diseases.

(5) A more even plane of anesthesia is maintained and the patient is not in and out of anesthesia as sometimes occurs in the inhalation method.

(6) There is less irritation to the kidneys and lungs, a comparative urinalysis bearing out the former, and clinical symptoms the latter.

(7) It is the ideal anesthetic in highly nervous individuals, especially those suffering with exophthalmic goitre.

(8) It is not recommended in young children.

(9) Nausea and vomiting are reduced at least 50 per cent.

(10) It more nearly approaches natural sleep than any anesthesia I have yet seen administered.

DISCUSSION.

DR. WALTER LATHROP, Hazelton, Pa.: It is a pleasure to appear again before this distinguished gathering of expert anesthetists, and to have the privilege of saying a few words on the subject of colonic anesthesia.

I am only speaking from the standpoint of a surgeon, and from my personal experience in some four hundred (400) or more consecutive cases in which this method was used.

The more I have it given, the better I like it, in those cases where it is indicated. In head and neck operations, it is ideal, and anyone who does much goitre surgery, need only use it a few times to be a convert to the method.

To the high strung, nervous, apprehensive woman, it offers the best method of nerve calming, before operation, of any means I know. The woman or man with exophthalmic goitre can be anesthetized, operated upon, and returned to bed with very little realization of what took place. In bone work, such as inlay graft, or suture, it is ideal, for the patient will remain quiet, and free from pain for a considerable period, thus permitting the dressings to become thoroughly fixed, and the possibility of displacement by muscular action is lessened.

Dr. Gwathmey deserves much credit for his work along this line, and he has awakened enough spirit of investigation in others to guarantee the method a fair trial.

I have seen no dangerous symptoms as yet; we have had none of the bowel irritations, mentioned by some writers, *whose technic must be faulty*, or *their preparation wrong*. We are using less ether than at first, and less oil: We now use in average cases, three ounces of ether, and one ounce (or 1½) of oil. *The bowel should be well cleansed by at least two enemas.* The preliminary treatment should be given about forty minutes before the

mixture. Our regular routine is to give two and a half drams of paraldehyde, one half ounce ether, and three drams olive oil (thoroughly mixed), at least thirty-five or forty minutes before operation; a hypodermic of ¼ gr. morphin and 1/150 gr. atropin is also given at this time.

The mixture of ether-oil is given about ten minutes before operation, or forty minutes after the hypodermic. It should be introduced slowly—*an ounce per minute,* and we sometimes use a few drops of anesthol in those cases who are at all restless, when the knife is first used—this is not common, but does occur in a small per cent. of cases, and it requires but a few drops to complete the stage of sleep desired. *The bowel is thoroughly flushed after operation.* A pint, or less, of plain water, or water with sodium bicarbonate added, is left in, and the patient returned to bed. Vomiting occurs in a smaller number of cases than after inhalation anesthesia. The method deserves use in selected cases.

ANESTHESIA AT THE FRONT

In order to give the readers of the Supplement some knowledge of what is doing in anesthesia at the front, the editor has gone over the more recent literature to secure facts and is herewith presenting the accumulated data from authoritative sources. In a personal interview with Col. T. H. Goodwin, R. A. M. C., of the British War Mission, and Col. Charles Dercle, of the French War Mission, during the recent meeting of the Interstate Anesthetists at Toledo, Ohio, the editor was impressed with the fact that these authorities, both of whom have served with outstanding merit since the beginning of the war, wanted only all-around physicians and dentists as anesthetists at the front. The pace is terrific, the skill required exceptional and the demands exorbitant, so only the most perfect physically and the most highly qualified can deliver the goods. It is a man's job. Aside from giving anesthetics, during intervals of comparative calm, the medical and dental anesthetist is called upon to cooperate with the medical, surgical and dental staff, and in that capacity he must be proficient in all lines of practice. During the heat of engagements he must be qualified to accept responsibility and take the initiative should emergency so require.

The surgeon general, so far, has given the rank of first and second lieutenant to the anesthetists enlisting in the Medical Reserve Corps. It is understood that some who have seen six months' service will be advanced to the rank of captain. In this connection it is of interest to note that the most noted and experienced American anesthetists are entirely outranked by their English confrères, who are mostly captains, majors and some even lieutenant-colonels. Nor has the British army suffered by according such rank to its anesthetists. They are specialists on a par with the physicians, surgeons and dentists in other specialties, their work is just as important and the good of the service can best be secured by proper rank. It is to be hoped that the Surgeon General will shortly act, through Congress, in securing proper promotion for the entire medical service of the army. Meanwhile the anesthetists are in the war to a finish and may be depended on to do their part.

The following excerpts speak for themselves:

SIX MONTHS' ANESTHETIC SERVICE AT A CASUALTY CLEARING STATION ON THE SOMME.

MAJOR CHARLES CORFIELD, R.A.M.C. (T.F.), M.R.C.S., L.R.C.P.
Assistant Anesthetist, Bristol General Hospital.

Probabaly no medical unit in the army has a stronger claim for skilled anesthetists than Casualty Clearing Stations. I was attached to a C. C. S. as special anesthetist, and it may be of interest to give some account of my experiences during the following six months.

On arriving at the C. C. S., I found the usual anesthetic equipment, viz., chloroform, ether, ethyl chlorid with Schimmelbush masks. I added to this by indenting for nitrous oxid and apparatus, and fortunately was able to procure them. From my point of view, patients were divided into two classes, those necessitating a short anesthesia, up to 10 or 12 minutes, who were given nitrous oxid, and those requiring a longer period, who were given chloroform and ether. The first class comprised wounds to be cut out and dressed, foreign bodies removed and guillotine amputations, and for such cases nitrous oxid was used. The advantages were both a saving of time and of labor. Time was saved, because the period of induction and returning consciousness were a matter of seconds, rather than minutes, and labor was saved because most of these patients could walk back to their own wards, either by themselves or with the help of one orderly; whereas chloroform or ether would have meant that every case would be a stretcher one.

For prolonging nitrous anesthesia, one had to use a gas and air mixture. My method was to get them deeply under, and then push back the air valve for a quarter to a third of an inch, so that the patient would get sufficient oxygen to keep him from asphyxiation. Patients varied in the amount they required. It was, one might say, a compromise between color and consciousness; with too much air, they became sensitive to pain, and with too little air they became cyanotic. Occasionally, one came across a patient who was difficult to keep under, because of clonic spasm and rigidity, and, in my experience, nitrous oxid is always a difficult anesthetic to give unless the patient can be lying on his back.

I never had any vomiting after this anesthetic, and I daresay most of the patients had a stomach fairly full of food. The condition of the bladder is important, and as so many patients voided their urine while under nitrous oxid, a bottle was given them as a matter of routine immediately before.

I find on referring to the records that average time of this anesthesia was seven to eight minutes, the longest period being 21 minutnes. As far as I could roughly calculate, the amount of nitrous oxid used was at the rate of about four gallons a minute.

Nitrous oxid cylinders take up a considerable amount of room. Cylinders carelessly screwed on to the stand lost half their contents by leakage. I, therefore, always fitted them on myself, and tested the joints under water afterwards. I found that greasing the screw-thread with vaseline, and having the cylinder nozzles cleaned of grit and dirt were very effective in making them screw up and so fit accurately. Washers I always cut from a large size drainage tube, and renewed them every time the cylinder was changed. Occasionally, a 100-gallon cylinder would be sent, and as this would not fit the stand, the india-rubber tube connection was screwed directly on to the nozzle and man-handled by a key. This entailed an extra orderly, and so such cylinders were kept for slack days.

We were fortunate in having a dental surgeon with us, who soon picked up the technic of prolonged nitrous oxid administration. In the busy times he proved a valuable help, giving me an opportunity of dealing with the more serious cases and those requiring considerable surgical interference.

In this work, my routine anesthetic was ether, preceded by chloroform, on a Schimmelbusch mask.

My method of covering the mask was to have an inside layer of lint covered by four or six layers of white gauze.

(*Continued on page* 36)

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F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

ANESTHESIA, ANESTHETISTS AND THE WAR.

It was recently brought to the attention of the EDITOR of the SUPPLEMENT that a prominent western surgeon, who was organizing a Base Hospital Unit for active service, contemplated the use of enlisted men as his anesthetists. The idea that men who never before in their lives have had an ether can in their hands and have never seen the inside of an operating-room can be momentarily transformed into anesthetists is a mistake in judgment bordering on criminal negligence.

England, which for years has given the licensed and qualified anesthetist his just due, has made its anesthetists lieutenants, captains and lieut.-colonels in the army medical corps, and Lord Northcliffe in a personal communication writes that after his nine visits to the front he is convinced that the anesthetist is one of the most important medical factors in the war.

When one stops to realize that the army surgeon of today is expected to handle on an average of seven operative cases an hour during the heat of action, it is palpably apparent that he cannot measure up to this standard of speed without the most expert assistance on the part of his anesthetist, orderlies and nurses. Nor can the anesthetist under such conditions be a tyro unless the service of the whole surgical staff is to collapse.

The Surgeon General, the Red Cross and Council of National Defense have seen fit to recognize officially the services of every specialty in medicine and surgery, except anesthesia, and yet, since the very outset of hostilities in 1914, the anesthetist has been one of the mainstays of the surgical service in the casualty stations, evacuation and base hospitals and the rehabilitation centers in blighty.

Official recognition is apparently being held up by the efforts of some surgeon to handle the entire anesthetic service in order to gain some passing notoriety or secure some personal advertisement or advance some individual methods.

The specialty of anesthesia has had its sections in the International Congresses of Medicine and Dentistry for years; the erstwhile London Society of Anesthetists is now the Anesthetic Section of the Royal Society of Medicine; while here in the United States the American and Interstate Associations, the New York, Providence, Louisville, Indianapolis and other societies of anesthetists have placed the specialty on an enviable footing.

The Organized Anesthetists have been appealing to the powers-that-be to extend the specialty official recognition and utilize the available anesthetic resources of the country in the present war emergency, but such recognition and mobilization is being delayed and presently there will be the same ghastly cry go up in this country that has gone up in England so often: "Too Late!"

The Organized Anesthetists are proceeding in the mobilization of their specialty awaiting the call of distress from those in authority. When it comes they hope to meet the emergency, although it would be far easier to do so in advance.—McM.

TO THOSE IN SERVICE.

The Editor of the Supplement would be pleased to hear from all those who are in active service or who have applied for commissions. The Supplement wishes to keep in touch with those who are responding to the Call to the Colors so that such service may become a matter of record in the annals of the various associations.

In this issue of the Supplement the Editor has begun the collation of data regarding Anesthesia at the Front. That this Department may serve its purpose those in active service are invited to keep in touch with the Editor and send him such observations on their work as may be useful in preparing others for service. A new chapter is being written in anesthesia and those who are participating in any phase of war surgery should not hesitate to contribute their bit of knowledge and experience.

ANESTHESIA AT THE FRONT

(*Continued from page* 34.)

The ether, when dropped on, soaks quickly through the looser woven gauze, and spreads out over the lint, and the gauze itself, in its cellular texture, enmeshes sufficient warm air from the patient's rebreathing to prevent the whole thing from getting very cold. Before beginning the anesthetic, I dropped about a drachm of chloroform on the inside of the mask, then holding it an inch or so above the patient's face, quietly talked to him and asked him questions. During this time, usually about a minute's duration, the mask would be lowered till it rested on the patient's face. Then ether was cautiously dropped on, gradually increasing up to saturation of the mask as it became tolerated by the respiratory tract. I then placed the corner of a towel, four fold, over the mask to conserve the warmth and increase concentration. By this method, I rarely got the slightest movement on the part of the patient, and he was generally ready for the operator in two minutes from beginning.

This method of giving chloroform means a high percentage at what is supposed to be the most risky period of anesthesia, and is for this reason against the orthodox teaching on the matter. However, during my six months' work, I never had a fatality, or, indeed, any case in which this method gave me anxiety. It had the merit of speed; two minutes, as I have said above, being the usual time to induce complete anesthesia, a record I have never been able to achieve with open ether alone. In cases in which it was possible, I gave a preliminary dose of omnopon an hour before the operation. The advantages of hyoscin, morphin and atropin for this purpose are common knowledge, and I need not dilate on the method beyond saying that it was particularly useful with us, for it kept patients quiet two or three hours after they had got back to the ward, and so saved the attention of a nurse or orderly.

I was always in favor of patients who could swallow at all having a pint of hot tea while waiting for operative treatment. It has the advantage of stimulating and warming them, they always like it, and it is a very effective *transfusion* too. Being liquid, even if vomited, no mechanical obstruction to respiration is likely to result.

It is a curious thing that in many patients who have had a meal just before they were wounded, the process of digestion or, at any rate, of stomach movement, is totally arrested, and they will often vomit food 10 or 12 hours after they have taken it. I remember one patient who, in the first stage of anesthesia, started to vomit violently, and brought up three bowlfuls of bully beef and biscuit. By the time he had finished he was fully conscious again, and I found out from him that he had had this meal 28 hours before, and had been wounded two hours after it.

I was fortunate during my six months' experience in having only one patient die on the table. He had a wound of the diaphragm on the left side, it being partially torn away from the costal attachment. He started with a fairly good pulse, which continued for half an hour, and then gradually got bad; he died in the course of 10 minutes. He was having open ether, and I think death was no doubt due to the abdominal condition.

One case, with considerable damage to the mouth and lower jaw, stopped breathing during anesthesia, and a laryngotomy was done. It was found that a large blood clot had occluded the glottis. He lived and did well. This certainly would have been a suitable case for the intratracheal method, and I think another time I should adopt it, or, failing that, a preliminary laryngotomy.

I must, before concluding, mention the fact that some weeks before I left the C. C. S. I had a Shipway ether apparatus in use, casualty clearing stations having been supplied with them. In theory, any effort to conserve the body heat of a patient seriously injured, must be an advantage, and for that reason, the Shipway apparatus justifies itself. I think, too, it is more economical of ether than the open method on a mask. But apart from these considerations, I have not been able to satisfy myself that it has any overwhelming advantage over the drop-bottle and mask. It is more cumbrous, and I find the bellows very tiring for the hand. A foot-bellows would obviate this, and might be added at very small extra cost or weight. Probably, with a larger experience, I should think better of this apparatus, and the authorities, at any rate, are sufficiently impressed with its advantages to send it to each of the hospital units in the field.

This article has been written in England, while home on sick leave, without the aid of notes. It is, therefore, culled from memory and has no statistics.

A METHOD OF ANESTHETIZING SOLDIERS.

W. J. McCARDIE, B. A., M. B., B. C. CANTAB.,
CAPTAIN R. A. M. C. (T.).

Anesthetist to the General, Dental, Ear and Throat Hospitals, Birmingham, and to the West Bromwich District Hospital.

I have long noticed that when coughing occurred during the early stages of etherization a change for a few minutes to chloroform stopped the cough and much lessened mucous secretion. The small quantity of chloroform inhaled exercised apparently a prolonged mitigating effect on the irritating quality of the ether. It seemed to me, therefore, that if the short interval of chloroformization had such a prolonged effect it might be worth while to try the addition of a small quantity of chloroform to the ether in Clover's inhaler, with the object not only of lessening irritation, but also of obtaining an anesthesia more nearly approaching the ideal—that is, a sleep-like one. Since chloroform acts as a depressant, but ether as a stimulant, it should be possible to obtain by a mixed vapor of these two drugs an anesthesia in which, while there is a proper muscular relaxation, the respiratory and circulatory functions are neither depressed nor stimulated but approximate to their condition during sleep. Such a mixture would probably differ in its proportion according as to whether the open or closed method were used, and also according to the type of patient, if the best results were to be obtained. Perhaps the best all-round mixture would be one in which the respiration and circulation are very slightly stimulated by the addition of a little more ether, thus ensuring safety and counteracting any shock arising from the operation. The idea is to take ether as the standard of safety and so to dilute or modify its action as to obtain some of the advantages of chloroform anesthesia. Ether thus modified by chloroform, as suggested later, possesses practically the safety of pure ether. When we use such mixtures as E_2C_1, E_3C_1, we regard chloroform as the main drug and modify its action by the addition of ether. It has been shown of late years that the mixing of chloroform with ether enhances the anesthetic power of each drug; indeed it has been asserted that a mixture of six or seven parts of ether with one part of chloroform increases the potency fully 30 per cent. without increasing the toxicity.

Having at the First Southern General Hospital, Edgbaston, the opportunity of anesthetizing soldiers—that is, patients of much the same age and type, and trained, fed, and living under the same conditions—I tried the effect of different mixtures of chloroform and ether administered by the closed method from a Hewitt's wide-bore modification of Clover's inhaler. To soldiers a routine method seems particularly applicable. They are mostly strong and fit men, well fed, much accustomed to tobacco and consequently with irritable throats; nearly all have coughs due to exposure to wet and cold indoors and out; their nervous system is on a much higher plane of tension than that of the normal individual during ordinary times, so that altogether as a type they are much more difficult patients in whom to induce anesthesia than are the general run of those met with in civil practice. On the other hand, when once induced, anesthesia is maintained in them more safely and easily than in the ordinary non-military patient, because, generally speaking, of the healthy conditions in which the former have been living. In fact, soldiers more nearly approach the normal healthy human being than does any other class of patients.

At the end of October, 1915, I began to use various mixtures of chloroform and ether in Hewitt's wide-bore Clover's inhaler, beginning with mixtures of E_4C_1, E_7C_1, E_8C_1, $E_{16}C_1$, $E_{18}C_1$, $E_{20}C_1$, $E_{22}C_1$, by volume.

In the first three of these mixtures the chloroform factor predominated too much for safety, causing blueness and too quiet respiration, whilst in the last one the ether component predominated too much, and the effect of the chloroform was practically negligible. Finally, in $E_{16}C_1$ I found a mixture which suited admirably my purpose, and have used it in more than 1,200 cases. Since the above-mentioned date it has been my routine method for the induction and often for the maintenance of anesthesia. The $E_{18}C_1$ and $E_{20}C_1$ mixtures I found very useful for debilitated patients.

In 1916 I administered $E_{16}C_1$ to 732 out of 843 cases at the First Southern General Hospital—that is, to practically 7 out of 8 patients.

I look upon it as and call it *mitigated ether,* and administer it exactly as I should ether by the closed method, the only difference being that during induction I very often allow one or two inspirations of air.

The respiration and circulation are slightly stimulated, the patient is of a good color, respiration being about half as deep as that during pure etherization. There is much less irritation of the respiratory mucous membranes than with ether alone, but if much coughing ensues during induction, as so often happens in soldiers, I immediately change down to a mixture of chloroform and ether, or more commonly to chloroform alone given by the open method. In fact, in the last few months, in nearly all operations which last longer than a few minutes, save rectal ones, after induction of anesthesia has been safely brought about and some degree of stimulation of the vital functions established by $E_{16}C_1$, I change down to chloroform and find it best suited to maintain anesthesia.

The contraindications to the addition of the small amount of chloroform to the ether are cases in which the fullest stimulation by ether is needed, as in patients in whom there is great shock, loss of blood, or toxemia, or where rapid dilatation of a sphincter or stricture is necessary.

As compared with pure ether, administration of $E_{16}C_1$ by Clover's inhaler causes less irritation, less muscular spasm, less mucous secretion, less excitation, and less obnoxious smell. The induction of anesthesia is quicker and quieter and muscular relaxation appears more quickly and is more complete. The addition of this small amount of chloroform seems to make a very great and advantageous difference. The $E_{16}C_1$ may easily be given without any preliminary administration of nitrous oxid or ethyl chlorid.

All soldiers have a preliminary intramuscular injection of morphin 1/6 of a grain, and atropine 1/100 of a grain, as nearly as possible half an hour before the time of operation, so that the maximum effect of these drugs is obtained. This injection is essential for quiet induction and stoppage of secretion. The effect of the morphin helps greatly to quiet induction and to maintain and steady the anesthesia. It also enables a lighter form of anesthesia to be used than is possible without it. The disadvantage of the morphin is that very occasionally, owing to the light respiration, the patient may become a trifle bluish under chloroform.

Since 1901, when I first used it by the closed method, I gave ethyl chlorid as a preliminary to etherization, but since administering "mitigated ether" it occurred to me that a better preliminary would be a few drops of a mixture of two parts of ether and one part of chloroform dropped into the bag of the inhaler, just as is ethyl chlorid. At first I used to drop the mixture on to a little wad of wool fixed in the angle piece to which the bag is attached, but I soon found it better to spray directly into the bag 15 to 20 drops (not minims—2½ drops are about equal to 1 minim) of E_2C_1. This quantity seems to be equivalent to the usual dose of 3 c.cm. of ethyl chlorid. The few drops of this mixture do not volatilize so quickly as does ethyl chlorid, the vapor does not surge into the head so rapidly, and the transition from the one mixture of chloroform and ether to another mixture of the same components seems somewhat easier, quicker, and smoother than from ethyl chlorid to ether or to *mitigated ether.* The small quantity of mixture so administered is far less costly and more convenient than ethyl chlorid, and I now use it before giving ether in private work.

With regard to the course of anesthesia during the administration of $E_{16}C_1$ I have had two cases in which respiration ceased, in one of which the fault was due to inadvertence. In both cases the pulse and color remained excellent, and respiration quickly restarted after a few compressions of the chest. Otherwise I have had no danger or trouble.

With regard to lung troubles I have had four cases of pneumonia and two or three of bronchitis.

All these patients had morphin 1/6 gram and atropin 1/100 gram before anesthesia, and had no mucous secretion; therefore there was no question of inhalation of septic material from the mouth.

Two other patients had a good deal of bronchitis afterwards. There was no prolonged sickness after any administration. It is very probable that in no case was the lung trouble wholly, or even partly, due to the anesthetic, because the patients had to be transferred after operation along draughty corridors to wards which were also sometimes draughty and cold, and were never intended for hospital use.

In the pressure of present-day hospital work rapid induction of anesthesia is necessary. The method described is all round the quickest and least unpleasant one I know, and is practically as safe as the more usual sequences of gas and ether or ethyl chlorid and ether. Refinements and time-spending methods of administration, such as gas and oxygen, intratracheal anesthesia, open ether *ab initio,* percentage inhalers, have little scope and less efficiency, when applied to tough fighting men, in the routine of a big and busy hospital. Safe, simple, and speed methods are the most valuable.

CONCLUSIONS.

1. The irritation caused by ether vapor administered by the *closed* method is much mitigated by the addition of a very small quantity of chloroform.
2. The addition of this small amount of chloroform to ether distinctly saves the work of the lungs and heart, which during a long or severe operation may be a very important factor.
3. The mixture is practically as safe as the administration of ether alone, because the ether greatly predominates.
4. It is valuable as a routine method of producing anesthesia in soldiers, being reasonably safe and rapid.
5. A few drops of E_2C_1 are preferable to ethyl chlorid as a preliminary to the administration of ether, or $E_{16}C_1$.
6. For maintenance of anesthesia E_2C_1 or chloroform are preferable to even *mitigated ether,* owing to the prevalence of respiratory irritability among soldiers.

PROPER RANK FOR AMERICAN ANESTHETISTS.

In a personal communication First Lieut. James T. Gwathmey writes as follows:

"I have been to the front with the French and also the British and expect to go to a casualty clearing station again with the British very shortly. Nitrous oxid-oxygen and ether is the only anesthetic for this kind of work as *speed* is the only desideratum. I have given as many as thirty-four anesthetics myself in one day—something that would be impossible with chloroform or ether.

"American anesthetists at the front are placed at a very great disadvantage as far as the men with whom they are thrown are concerned. Most of the English army physicians giving anesthetics have the rank of captain, some are majors and a few even lieutenant-colonels. Would it be possible for you to help correct this matter by writing to Surgeon General Gorgas and urging him to rank American anesthetists, at least on a par with their English associates in the same specialty.

"All the medico-military men at the front are here to stay until this thing is over and Fritz will have received the licking that is due him. Over here it looks as if the war will be over by this time next year, even if the Germans manage a separate peace with the Russians.

"Chloroform anesthesia should be prohibited absolutely

in the American Army surgical service. The nearest approach to it should be chloroform and ether, equal parts, and this should only be allowed as the induction and *not* as the terminal anesthetic. Ethyl chlorid should also be discouraged as so many of the men are *shocked* to a degree unknown in civil life, and sink rapidly under the anesthetic. We should limit ourselves to ether, nitrous oxid-oxygen or a combination or sequence of these anesthetics and only use the C-E mixture as an induction anesthetic.

"Aeroplanes are the things that will end the war, and if America can supply enough of them this in itself will be the biggest single factor in winning a decisive peace, as any one can testify who has been *bombed!*"—General Hospital No. 9, Lakeside Unit, B. E. F., Rouen, France.

FOREIGN ETHER—CHLOROFORM AND ETHYL CHLORID—ANESTHETIC SERVICE.

In a personal communication First Lieut. Arthur E. Guedel writes as follows:

"I am beginning to understand why ether in Europe has been so slow in displacing chloroform. The ether they are using here is *rotten*. It is not much better than our wash ether at home. It is difficult indeed to put a patient to sleep with it, to say nothing of securing a quiet state of anesthesia. From the coughing and great quantities of mucous secreted it would seem to contain more sulphuric acid and formalin than anything else. Also it is about as volatile as alcohol. You never get any frosting on the mask. Usually a patient will walk right out from under anesthesia with this ether in spite of continuous administration, and a clean mask becomes soggy and useless after about ten minutes.

"Whether or not this ether is the usual European ether I am not certain, but from many inquiries that I have made I am led to believe that it is. They say over here that it requires a very skillful man to give ether, and take it from me it does. I have not been able to get by with it (with this foreign ether) and I have failed to see anyone else do it.

(This verdict is supported by Dr. R. H. Ferguson, who on his European tours demonstrating the drop method of etherization always carried his own supply of American ether. It is also interesting to add that very soon after the advent of Major Grayson P. Murphy, of the Red Cross, in France, he cabled home for 100,000 half-pound tins of ether and paraphernalia and operatives for a gas-oxygen plant.—Ed.)

"Their chloroform and ethyl chlorid are all right and most of the anesthesia here is accomplished with these agents. I have come to the point that, with all my anti-chloroform prejudices I am using chloroform in all cases when I cannot get *American ether.* For the short anesthesias I use ethyl chlorid on an open mask and like it. Nitrous oxid here is almost out of the question. I understand Major Crile brought a lot of it over for the Lakeside unit, but I do not know of any other available source here at our part of the front. A number of units have gas apparatus, but at present *nothing to use in them.*

"It scares me green to see the way they pour on choloroform here. They use it about as we do ether back home. They don't seem to fear it at all, but that may be because of the extremely low price fixed on human life in this war. They have their accidents, of course, but seem to think them infrequent.

(In this connection it is of further interest to note that M. Quenu and M. Reynier, two of the most prominent surgeons in France, the latter also a noted anesthetist in his day, have been debating the question as to whether a wounded soldier can be compelled to undergo an operation under chloroform anesthesia under penalty of minimal pension from the consequent disability. The former maintains that cholorofrm is so dangerous that soldiers cannot and should not be coerced, the latter maintains that choloform is comparatively safe and the whole problem has been submitted to a special Committee of the French Government for solution.—Ed.)

"As for anesthesia in the American army this should be given some general attention by all means, by the United States authorities. As it is the methods are slipshod and careless to a degree that causes an enormous wastage of anesthetic material and occasional accidents which are costly to the government, to say nothing of the occasional life of an American soldier. As it is the surgeon, no matter what his experience or rank, has full control of the anesthesia for his cases and as a rule he knows nothing of anesthesia. With such surgeons the co-operation of skilled anesthetists is a secondary consideration.

"This matter should be and could be regulated to the great advantage of all concerned. A system of suggestions and instructions to the medical corps of the army in general, based upon observations of the needs of this particular war in the matter of surgical anesthesia, would go far toward saving money, time and life. Don't you suppose it possible to bring about some official consideration of anesthesia in this war? It is certainly badly needed. Every scientific branch of service in the army at this time is advancing except anesthesia and that is still regulated by rule of thumb. Give it some thought yourself. If you or Dr. MacDonald could do anything to help the conditions and better them, it would surely be worth while.

"This army life over here is pleasant enough in general. I have been here now for several months with the Mackey-Roosevelt Base Hospital Unit and we are beginning to get busy. Most of our patients, so far, are French soldiers who are sent down from a sector of the front where they pull-off a periodical drive." (Mackey-Roosevelt Base Hospital Unit, American Expeditionary Force, France).

WORK OF THE SURGICAL TEAMS AT CASUALTY CLEARING STATIONS

Major Kellogg Speed writes the following to the Journal of the American Medical Association:

"In addition to administrative officers, etc., there are assigned to each Casualty Clearing Station surgical teams, composed of picked men of surgical ability, *each supplied with his own anesthetist,* operating nurse and orderly. These teams divide the major and minor surgical patients in rotation as fast as they are able to finish each operation. Team work is divided thus: Each team works for 8 hours a day, except during rush times, when they are expected to do 16 hours duty. Three teams are on duty from 9 a. m. to 5 p. m. in the major theater, using 5 or 6 operating tables; two teams work from 5 p. m. to 1 a. m. and one team from 1 to 9 a. m. under ordinary conditions. The work is continuous as long as the hospital is taking in. Teams cease to take on patients one-half hour before the expiration of their time so that their table may be cleaned and prepared for the next group.

"The major operating theater is centrally located; the minor theater is near the dressing tent. All are electrically lighted. *The arrangement of five or six tables in the major theater permits the anesthetist to move from patient to patient in advance of the operator, while dressing and splints are being applied or the operation is being finished.* The operating nurse assists the surgeon; the orderly brings supplies, helps with the dressing and cleans up the table. There is complete independence for each team.

"An ample supply of dressings, gloves, instruments and splints is at hand and the sterilizers for instruments are constantly boiling during work. After instances of gas-infection or before serious operation—especially head and joint—a complete clean-up of the surgeon and nurse is expected; otherwise for extremity wounds gloves may be washed on the hands and then dipped into sterilizing solutions.

"Nitrous oxid gas, ethyl chlorid, choloroform and ether anesthesia are used. The Shipway warm vapor choloroform-ether apparatus is much in vogue and is very useful for nasal anesthesia in head operations.

"Great rapidity and thoroughness of operative procedure is required. In time of stress the minor operating theater can be expanded to permit the performance of major operations." (No. 12 Casualty Clearing Station, B. E. F.)

ETHER ANESTHESIA IN WAR SURGERY WITHOUT PULMONARY COMPLICATIONS.

At one of the recent meetings of the Académie de médecine, Dr. Mériel, professor of the surgical clinic at the Faculté de médecine de Toulouse, presented a com-

munication on this subject. The main point that he claimed to establish was that the pulmonary complications frequently brought on by ether anesthesia are avoidable if a careful technic is employed during and after anesthesia. Julliard had already published statistics on nearly 10,000 etherizations without untoward effects of this kind. Mériel declared that since 1909 out of 4,880 etherizations he had not noticed a single grave complication; only occasionally in winter there had been a few benign cases of trachitis, which only rarely degenerated into bronchitis. As the result of long experience, Mériel was able to state that, if certain precautions are taken, ether anesthesia is not only easy to accomplish, but is also without any real danger, and is contraindicated only in the case of emphysematous and tuberculous patients, and can be employed even in operations about the face and neck.

HYPNOTIC SUGGESTION FOR RELIEF OF THE WOUNDED IN THE FIELD HOSPITAL

Podiapolsky writes from Saratov in Russia to call attention to the way in which he has sometimes been able to free the wounded from suffering by hypnotic suggestion that there was no pain or by throwing them into a hypnotic sleep. He describes in detail a number of peculiarly distressing cases in which the immediate relief was most welcome. In war conditions he has found that the men responded with exceptional facility to hypnosis; he found only about 2 per cent. quite refractory. In conclusion he exclaims, "Why give chloroform to subjects who at a word drop off into an artificial deep slumber, which can be counted on in about 17 per cent. of the cases." Even the first degrees of hypnosis permit operations with much less of the general anesthetic than would otherwise be necessary. He has found it useful for the wounded of all the nationalities that he has encountered. Slavs, Teutons and Italians. He does not advise the hypnosis for major operations but mainly for the sensory crises of psychic origin, such as the pain left apparently in a limb after it has been amputated. A single hypnotic sitting may cure completely distressing pains of this nature. Podiapolsky's polyglot environment caused trouble sometimes, as he did not always know the word for "wake up" in the patient's own tongue. Now he makes sure of this before attempting the hypnosis. (Paris Medical, August 25, 1917).

(To be continued)

Society Proceedings

Membership in a society devoted to your specialty is an essential to success.

INTERSTATE ASSOCIATION OF ANESTHETISTS. THIRD ANNUAL MEETING.

The Third Annual Meeting of the Interstate Association of Anesthetists was held at the Hotel Secor, Toledo, Ohio, October 9, 10 and 11, in conjunction with the Mississippi Valley Medical Association. There was a large attendance of interested surgeons, anesthetists and dentists in spite of war conditions which had called many into active service.

Dr. Charles W. Moots, of Toledo, Ohio, welcomed the Association in behalf of the local profession.

During the executive session the following officers were elected for the ensuing year: Elmer I. McKesson, M.D., Toledo, O., Chairman; John J. Buettner, M.D., Syracuse, N. Y., Vice-Chairman; F. H. McMechan, M.D., Avon Lake, O., Secretary-Treasurer; Members of the Executive Committee, Bion R. East, D.D.S., Detroit, Mich.; Emmett F. Horine, M.D., Louisville, Ky.; E. M. Sanders, M.D., Nashville, Tenn.; Wesley Bourne, M.D., Montreal, Canada; Thomas L. Dagg, M.D., Chicago, Ill., and Paul Cassidy, D.D.S., Cincinnati, O.

The minutes of the Louisville Meeting and the report of the secretary-treasurer were accepted as read.

Resolutions of condolence were extended to the families of Drs. W. P. Burdick, of Kane, Pa.; R. E. Holder, of Columbus, Ind., and Geo. H. Matson, of Columbus, O., members who had died during the past year.

The following resolution was passed unanimously:

Whereas, The Call to the Colors and the requirement of the army medical service at home and abroad will necessitate the services of many experts in anesthesia, therefore, be it

Resolved, that the Interstate Association of Anesthetists pledges its support to the Government and army medical service in the present emergency and that its members will serve in whatever capacity their experience is desired.

It was voted to release members in service from the payment of dues and to make up any deficit by a pro rata assessment on the other members, if necessary.

The following members were appointed as the nucleus of a Legislative Committee to look after the interests of licensed and qualified anesthetists in the United States and Canada: W. I. Jones, D.D.S., Columbus, O.; E. F. Horine, M.D., Louisville, Ky.; T. J. Collier, M.D., Atlanta, Ga.; C. N. Combs, M.D., Terre Haute, Ind.; Isabella C. Herb, M.D., Chicago, Ill.; Ralph P. Peairs, M.D., Milwaukee, Wis.; E. M. Sanders, M.D., Nashville, Tenn., and Samuel Johnston, Toronto, Canada.

The secretary was instructed to cast the Association's ballot for the election of the following new members: H. W. Barton, D.D.S., Akron, O.; Henry F. Becker, M.D., Danville, Ill.; S. L. Beckwith-Ewell, D.D.S., Hartford, Conn.; Theodore D. Casto, D.D.S., Philadelphia, Pa.; Leroy S. Colter, M.D., Cincinnati, O.; C. N. Combs, M.D., Terre Haute, Ind.; Chas. H. Gallagher, M.D., Ithaca, N. Y.; F. R. Hanley, M.D., Toronto, Canada; G. A. Havemann, M.D., New Bremen, O.; Edw. Wm. Hawkins, D.D.S., Pittsburgh, Pa.; O. C. Hickman, D.D.S., Windsor, Cal.; Walter H. Hisey, D.D.S., Toledo, O.; M. R. Howard, D.D.S., Denver, Colo.; Margaret M. Johnston, M.D., Toronto, Canada; P. H. Kilbourne, M.D., Dayton, O; Louis H. Maxson, M.D., Seattle, Wash.; E. M. Morehouse, D.D.S., Yankton, S.D.; H. F. Parks, D.D.S., Jackson, Mich.; Ralph P. Peairs, M.D., Milwaukee, Wis.; Ralph M. Waters, M.D., Sioux City, Ia.; F. X. Siegel, M.D., Cincinnati, O.; F. L. Richardson, M.D., Boston, Mass.; J. P. Snyder, D.D.S., Columbus, O.; W. F. Dramburg, D.D.S., Milwaukee, Wis., and Iva M. Lickly, M.D., Lima, O.

The scientific program was presented as previously announced. The various papers will appear in the Supplement. A number were illustrated with lantern slides and moving pictures, which were shown by courtesy of the Temple Theatre management.

The Association had the distinguishd honor of having as its guests Col. T. H. Goodwin, R.A.M.C., and Col. Charles Dercle, of the French War Mission. Both addressed the joint meetings of the two societies.

The Association Dinner was served at the Hotel Secor on the evening of October 9 and was largely attended. Among the speakers were Dr. George F. Butler, of Mudlavia; Dr. Lafayette Barber, President of the National Dental Association, and Dr. Ira O. Denman, Secretary of the Homeopathic Laryngological Association.

The ladies attending the meeting were delightfully entertained and the local profession and the Toledo Commerce Club outdid themselves in showing all a splendid time.

The Indiana State Medical Association has extended the Interstate an invitation for a Joint-Meeting in Indianapolis next September. Its acceptance was left to the discretion of the executive committee.

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[American Journal of Anesthesia and Analgesia]

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April, 1918

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CHANGES PRODUCED IN THE BLOOD BY NITROUS OXID-OXYGEN ANESTHESIA.*

THEODORE D. CASTO, D. D. S.
PHILADELPHIA, PA.

These experimental animals were albino rats (*Mus Norvegicus, var. Alba*) obtained from the Wistar Institute, litters of from three to six animals of uniform size and weight being used.

The skin of these animals is so thin and their eyes so pink that any change approaching lividity or cyanosis could be readily noticed. Changes in the appearance of the eyes were always very apparent, even before any lividity could be seen in the veins of the ears or tail.

From these families of five or six, two or three were taken as control animals, so that our tests for normals were made from animals of the same weight and feeding as the anesthetized ones.

In a previous paper by the author (*Dental Cosmos,* lvii, 881, 1915) it was reported that nitrous oxid and oxygen anesthesia in man gives rise to a decrease in the erythrocytes; thirty or forty minutes after anesthesia a tendency was noted for the count of erythrocytes to return to its normal value as determined prior to anesthesia.

In a paper before the Panama Pacific Dental Congress (*Dental Items of Interest,* xxxviii, 595, 1916), the writer described the hematological changes in rats under nitrous oxid and oxygen anesthesia. A further report of the latter research is given in the present communication; the influence of anesthesia produced by nitrous oxid and oxygen upon the degree of alkalinity of the blood has also been studied.

The carbon dioxid-carbonic acid-content of the alveolar air and of the blood in a sense controls respiration, since carbon dioxid stimulates the respiratory center. According to Haldane (*Science,* n. s. xliv, 624, 1916), under normal conditions the carbon dioxid content of the alveolar air has an almost constant value of 5.6 per cent. Carbon dioxid forms by far the greatest portion of the products of metabolism which are acid in nature. Formed in the tissues, it is absorbed by the blood plasma and carried to the alveoli of the lungs; here it is largely replaced by oxygen in the gas exchange, and the blood, as it leaves the lungs, normally contains in solution air which has a carbon dioxid content of 5.6 per cent. If the carbon dioxid content of the circulating blood and of the alveolar air becomes abnormally high, the respiratory center is subjected to an added stimulation, and causes a deeper and more frequent respiration. As a result of this ventilation, the excess of carbon dioxid is expelled through the lungs, and the normal relations between acids and bases are restored in the blood. The hydrogenion concentration or degree of alkalinity of the blood is thereby kept approximately constant.

If, through disease or medication, acids which are not excreted through the lungs are formed and enter the blood stream, more rapid and deeper breathing may compensate their presence and maintain the normal alkalinity of the blood. Should the quantity of these non-volatile acids be such that increased respiration does not maintain the normal alkalinity of the blood, the condition known as acidosis exists, and the blood becomes neutral or even acid in reaction.

HYDROGEN-ION CONCENTRATION OF THE BLOOD.

In physical chemistry the reaction of a solution is expressed by its hydrogen-ion concentration. This term requires an explanation. Study of solutions has shown that when a compound belonging to the group of electrolytes—which includes practically all acids, bases, and salts—is dissolved in pure water, the compound undergoes electrolytic dissociation into a positively charged ions and negatively charged ions travel with the current to the negative pole and the positive pole respectively. Thus hydrochloric acid yields the positively charged hydrogen ion H+, and the negatively charged chlorid ion Cl—. In fact, all acids yield the H+ ion. On the other hand, all bases yield the negatively charged hydroxyl ion (OH)—.

When hydrogen-ions predominate in a solution, it is acid in reaction; when hydroxyl ions predominate, it is alkaline in reaction. When the hydrogen and hydroxyl ions are present in equal quantities, the solution is neutral in reaction; this condition exists in pure neutral water, which is slightly dissociated into hydrogen ions and hydroxyl ions. One liter of water at a temperature of 20° C. contains 0.0000001 (one ten-millionth) gram of hydrogen ions; using the nomenclature of standard solutions, and volumetric analysis, this represnts a hydrogen-ion concentration of 0.0000001 normal, which may also be written 10^{-7} normal, or, as suggested by Sorensen (*Ergebnisse der Physiologie,* xii, 393, 1912), p H 7.

Since the number in the term pH is the negative exponent in the logarithmic statement of the hydrogen-ion concentration, when the number is less than 7, the solution is acid; when it is greater than 7, the solution is alkaline. Thus the hydrogen-ion concentration is pH6 in a solution which has an

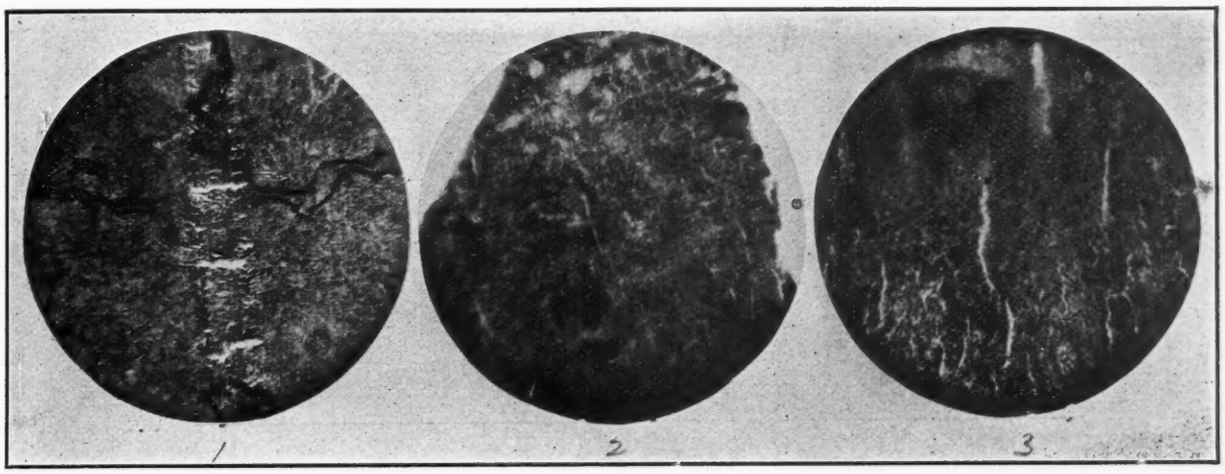
* Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Vallley Medical Association, Toledo, O., October 9-11, 1917.

acidity 0.00000 normal, and is pH8 in a solution which has an alkalinity 0.00000001 normal.

METHODS OF DETERMINING HYDROGEN-ION CONCENTRATION.

The two more common methods for the determination of the hydrogen-ion concentration of a solution are the electrometric method, using a gas chain or hydrogen electrode, and the indicator method. In the indicator method a suitable indicator is added to the solution of unknown hydrogen-ion concentration, and to a series of standard solutions of which the hydrogen-ion concentration is known, having been ascertained by the electrometric method. By matching the color of the unknown solution against the known solutions, the hydrogen-ion concentration of the unknown solution is readily determined. The chief obstacle to the application of this method to blood has been the color of the blood itself. This obstacle has been overcome in a method recently devised by Levy, Rowntree, and Marriott (*Archives of Internal Medicine,* xvi, 389, 1915), who dialyzed the blood contained in a celloidin sack against physiological salt solution, and determined the hydrogen-ion concentration in the dialysate, which is free from proteins and blood pigments, by the colorimetric method, using phenol-sulfone-phthalein as the indicator; this compound "exhibits definite variations in quality of color with very minute differences in hydrogen-ion concentration between pH 6.4 and 8.4. For standards of known hydrogen-ion concertration they use a series of solutions; each contains monopotassium phosphate and disodium phosphate mixed in definite proportions. Their procedure renders it possible to determine the figure in the pH to a tenth, and at times, by interpolation to a twentieth (0.05) of a unit. For the details of their procedure, reference should be made to their original report.

Marriott (*Archives of Internal Medicine,* xvii, 840, 1916), has modified this method, so that, in addition to the hydrogen-ion concentration of the blood, the alkali reserve of that fluid is also determined. The procedure is quite simple. After pH has ben determined in the usual manner, a current of air is forced through the dialysate from the blood for a period of three minutes in order to expel the absorbed carbon dioxid; the dialysate is then compared with the standards of known hydrogen-ion concentration for a second time in order to determine its hydrogen-ion concentration. This residual hydrogen-ion concentration is termed RpH; the difference between RpH and pH represent the alkali reserve of the blood and also is a measure of the carbon dioxid content of that fluid. As the alkali reserve of the blood diminishes and the condition of acidosis is approached, the numerical value of RpH becomes lower than normal.



Figs. 1, 2, 3. Photomicrographs from sections of the spleens of *normal* rats. Figs. 1 and 2 from 2/3 and Fig. 3 from 1/6 Objective.

METHOD OF EXPERIMENTAL PROCEDURE.

The animal to be anesthetized was placed on a table under a bell jar. The supply pipe for the gas was carried up through a hole in the table and allowed to enter 2½ inches above the top of the table. The exhaust tube was even with the table top, and had an elbow under the table so that escaping gas might be collected for analysis. The whole appliance was sealed by pouring melted paraffin around the edge of the bell jar, an airtight apparatus being thus secured into which the gas was readily delivered. In this chamber the animal could be kept under constant observation, and anesthesia was readily controlled, while such outside influences as fright and shock could be avoided.

Nitrous oxid and oxygen were delivered into the jar by one of the modern appliances for measuring

and regulating the flow of the gas. At first a large amount of oxygen was given, 25 parts oxygen and 75 parts nitrous oxid, which was gradually reduced to 5 parts oxygen and 95 parts nitrous oxid. (The chamber in which the animal was anesthetized being large compared with the respiratory requirements of the animal, satisfactory anesthesia was not readily produced by immediately using the latter mixture.) All the animals were kept in a narcosed condition for at least thirty minutes. An examination of the clinical records of the animals anesthetized shows that after the first collapse many of them developed a certain amount of immunity to large doses of nitrous oxid. A careful record was made of the physical changes produced in each animal under anesthesia; respirations were counted every five minutes, cyanotic conditions being noted.

Figs. 4, 5, 6. (4) Rat 20 under gas for 88 minutes. Sections of spleen seem to be normal in every way; 2/3 Objective. (5) Rat 22, under gas 70 minutes, the section of spleen showing no deviation from normal. (5) Rat 23, under gas for 126 minutes. Tissues normal.

and the movements of the body were observed throughout the period of narcosis. The hind legs became paralyzed first, and weakness in the back muscles were observed some time before anesthesia was produced. At this stage the animal would respond to any loud sound by pulling itself about with the fore feet, absolutely no motion being made with the hind feet. The paralysis was followed by deep anesthesia, with the respirations running from fifty to seventy-two per minute; below 50 the drop in respirations became very rapid. The animals were often restored after the respirations had dropped to 6 or 10 per minute by using a large supply of oxygen and resorting to artificial means such as compressing the abdomen and holding the animal up by the tail. After anesthesia had been continued from thirty-five minutes to one hour the animal was removed from the anesthetic chamber, killed by quick decapitation, and sufficient blood secured to make a study both of the changes in erythrocytes and lecocytes and the hydrogen-ion concentration.

EXPERIMENTAL RESULTS.

The erythrocytes and the lecocytes were counted by means of a Thoma-Zeiss pipet and counting chamber, and a differential study of the leucocytes was made using a double stain of the methylene blue and eosin. The pH of the blood was determined by the method of Levy, Rowntree, and Marriott, and the RpH by the method of Marriott. The standard solutions of known hydrogen-ion concentration were checked by means of the hydrogen electrode or gas chain.

R. O. Chisolm (*Quarterly Journal of Experimental Physiology,* iv, 207-229, 1911), made a count of the erythrocytes in 50 rats, getting an average of 8.8 millions per cubic millimeter.

Rivas (Quoted by Donaldson: *"The Rat." Memoirs of the Wistar Institute,* No. 6, 40-41, 1915), reports a series of ten counts of erythrocytes in normal rats. The number of erythrocytes varies from 7.4 millions to 9.2 millions per cubic millimeter. He also reports a differential count of the leucocytes in the same animals.

In the present study a much greater variation was found in the erythrocytes, there being a difference of 4.8 millions per cubic millimeter between the highest and lowest counts in the 21 animals studied.

The ervthrocytes were decreased in number after anesthetization with nitrous oxid and oxygen for thirty minutes to one hour, the maximum decrease in the 20 animals studied being 70 per cent., the minimum 1. per cent., with an average of 25 per cent. Marcroytes and microcytes were present in a few cases, but no poikilocytes or nucleated cells were observed. The ability of the erythrocytes to

retain their stand was also found to be slightly lessened in a few animals. The leucocytes did not show any change in actual number that was constant throughout the series of experiments, there being a decrease in number in 12 out of the 20 animals, and an increase in 8. A study of the different varieties of leucocytes, however, showed a marked tendency on the part of the polynuclear neutrophiles to decrease and of the lymphocytes to increase. Of the 20 animals studied, 18 gave a decrease in polynuclear neutrophiles, varying from 1 to 75 per cent., and 16 of the 20 animals gave an increase in lymphocytes varying from 5 to 23 per cent.

A study of the transitionals and eosinophiles showed that there was no change of special interest, the decrease and increase being about equal throughout.

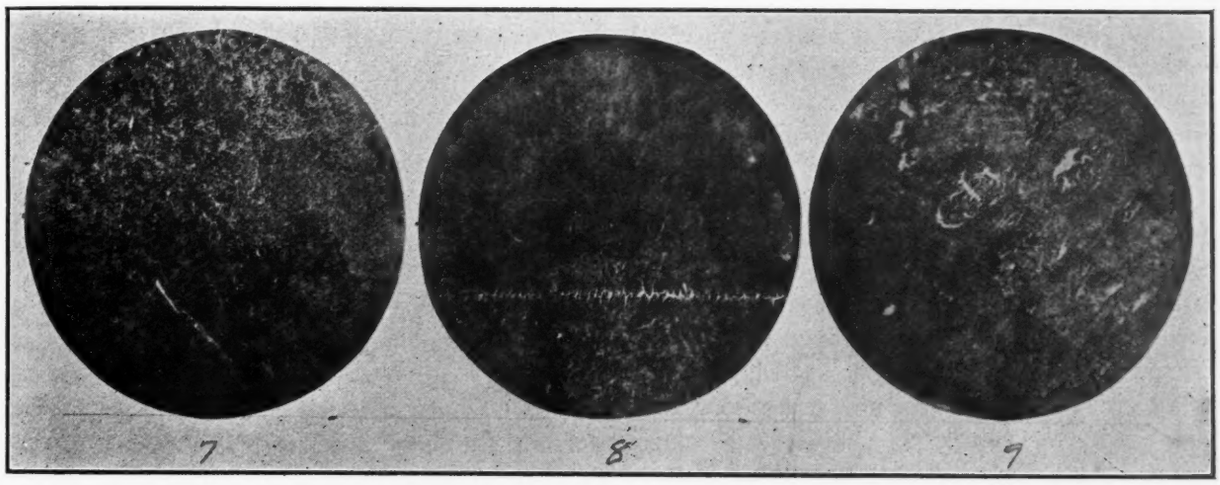
A study of the segamentation of the polynuclear neutrophiles also revealed little of interest, no constant change in either direction being observed.

VARIATION OF ACIDOSIS.

While both pH and RpH showed wide variations between their maximum and minimum values in both the normal and the anesthetized rats, careful scrutiny of the apparatus, the reagents, and the technic failed to reveal any reason for rejecting any of the results. Since the average value of pH is slightly less in the anesthetized rats than in the normal animals, the hydrogen-ion concentration was slightly greater in anesthesia than under normal conditions. As to RpH, it was numerically greater than 7-neutrality, in two-thirds of the normal rats, and in but one-third of the anesthetized rats, showing that the alkali reserve of the blood was depleted during anesthesia. This decrease in the alkali reserve was comparable to that of a mild acidosis in man. This does not convince us that this death is brought about by acidosis.

The average RpH was 7.95 in normal rats and 7.60 in anesthetized rats, a difference of 0.35. Marriott's figures for RpH in man are: Normal adults 8.4 to 8.55, moderate degree of acidosis 8.0 to 8.3; the difference here would be between 0.1 and 0.55.

There is no doubt that the animals in these experiments which show a pH of 6.6 or anything below pH 7 should be eliminated as no animal could live with this amount of acidosis. This reading can be explained by the method of obtaining the blood. This was as follows: the animal was decapitated and the blood drained into the cup and no doubt but that some part of the stomach contents were collected in some experiments in normal and anesthetized rats. If these are not counted an average of 7.42 pH and 8.05 RpH is obtained for twelve normal rats, and an average of pH 7.21 and 7.68 RpH for the sixteen anesthetized rats.



Figs. 7, 8, 9. (7) Rat 23, Malpighian corpuscles more diffuse in character; 2/3 Objective. (8) Rat 28 under the bell jar for 90 minutes. There is a decrease in the number of Malpighian corpuscles, probably also a diminution in the number of lymphocytes. This may, however, be a normal condition and not due to the narcosis. 2/3 Objective. (9) Rat 35, under gas for 34 minutes. This section shows an increase in the number of Malpighian corpuscles, but there is no evidence that this is due to the anesthesia. 2/3 Objective.

HISTOLOGICAL EXAMINATIONS OF SPLEENS.

To determine the role of the spleen in the blood changes under anesthesia sections were properly prepared and stained with hematoxylene and photomicrographs made. Expressed in general terms it may be said that no evidence was developed from the sections examined showing any profound or even slight pathological conditions existing.

We must conclude, as far as these studies have been made, that there are no radical changes which take place in the tissue of the spleenic pulps, the cells nor in the malpighian corpuscles of the spleens of those rats which were given a continuous dose of nitrous oxid-oxygen until death supervened.

In closing we wish to express our appreciation of the co-operation extended in these studies by E. I. St. John, M.D., and A. Hopewell Smith, N.R.C.S., L.R.C.P., D.D.S.

A clinical record of the experiments from which the data for this paper was secured will be sent to all those desiring reprints upon request

1831 CHESTNUT ST.

EXPERIMENTAL RESEARCHES IN THE WARMING OF NITROUS OXYGEN FOR ANESTHESIA.*

PAUL CASSIDY, D. D. S.,
CINCINNATI, O.

It is a fundamental physical law that the transformation of a solid into the liquid state, of a liquid into a gas, deprives the surrounding media of a definite number of heat units, and, hence, brings about a lowered temperature therein.

The temperature of any substance is dependent upon the mode of motion of the particles involved. The particles of a liquified substance are not able to move with the same freedom as when that same substance is in its natural, gaseous state. Hence any change from a liquid to a gas involves a greater freedom of motion of these particles, which every change in their mode of motion, in consequence, absorbs heat units from the surrounding media. We can, therefore say, in unscientific language, that cold is developed in all things immediately surrounding any substance in the process of being changed from a liquid into a gas.

To assert that liquified nitrous oxid is any exception to this rule is scientifically absurd. Any experiments that have been performed, in good faith, which seem to indicate this exception, have not been properly conducted, and are, in consequence, of no real significance.

Having been a believer in warmed vapor for anesthetic purposes for fifteen years, I have been much interested always when the assertion has been made that nitrous oxid in particular does not require warming, as, indeed, it is always of the temperature of the atmosphere by which it is surrounded. A report of five hundred cases, with the varying results obtained in the use of warmed and unwarmed nitrous oxid administered for short duration anesthesia was made by me one year ago. The statistics of one man are seldom satisfactory to others, and I expected my findings to follow this course. My deductions, however, did call forth one assertion which I have felt it was to the interest of all finally to disprove. I had said that nitrous oxid flows into the anesthetizer at a temperature of anywhere from 40° to 60° Fahrenheit scale. This was absolutely denied. To prove my deduction entirely a correct one, I decided to construct an apparatus that would permit of the accurate reading of varying temperatures within a nitrous oxid anesthetizer. The result has only confirmed me in my belief, and I submit it to you today, gentlemen, at least to indicate to you that there is a considerable danger to all patients anesthetized, for even a short time, with unwarmed, or inadequately, warmed, nitrous oxid vapor changed directly from the liquid state.

It may seem unnecessary to a majority of you that any note of warning at this late day should be uttered against the administration of unwarmed nitrous oxid. You have all of you administered this gas through heated and unheated anesthetizers. Some have continued, unthinkingly, to use the warming devices for no other reason than that it was considered the proper thing to do. Others, more observant of results, have discarded the warming attachments because the heated and the non-heated vapors apparently acted in about the same fashion. And they did, for the very simple reason that the heating devices attached to most of the anesthetizers on the market are wholly unable to raise the gases passing through them to any appreciable extent. The heating chambers are so small and the heating elements of so little power that whether they are employed or not, the gases pass through them at practically the same temperature. You, therefore, who have abandoned your warming attachments on the assumption that all warming is unnecessary, have done so upon a wrong surmise. Inadequately warmed vapor is little better for anesthetic purposes than unwarmed vapor. This fact will hardly justify, however, a refusal properly to warm the gases when this result can and should be obtained.

I have not come to you today in professional guise to cry the wares of any manufacturer of anesthetizers. I only assert that it is a fact that in few, if any, of the machines that have been presented for our use will the gases passing through them, be raised to the proper temperature for anesthesia. If it is advisable to inject liquids for regional anesthesia at a temperature approximating that of the body, it is, at least, as necessary to administer gaseous anesthetics at about the same temperature when possible. I am confident that the very reason for the considerable success of the early users of nitrous oxid, even though their equipment was otherwise to be condemned, lies in the fact that the anesthetic was delivered to the patient at about the body temperature, and with no preexistence in the liquid state.

Properly to understand that these experiments were not conducted in a haphazard fashion, relying principally upon guess-work for results, as has been done in the past, a description of the appartus employed will be necessary.

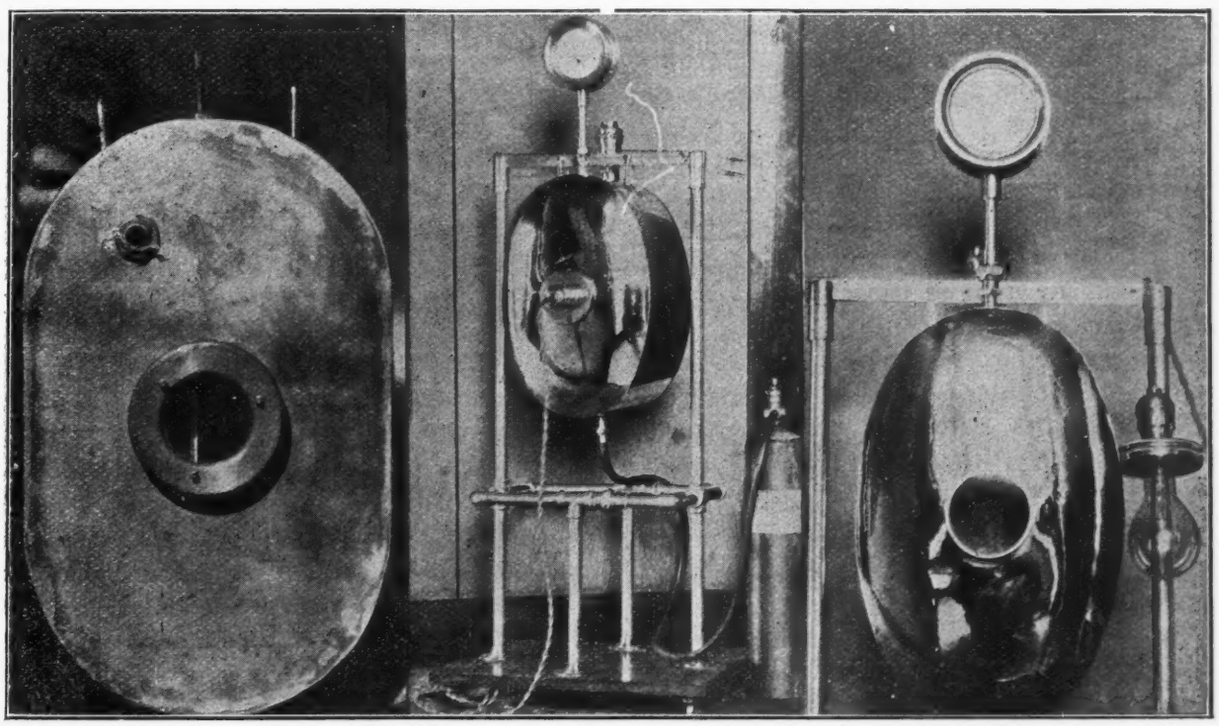
* Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Vallley Medical Association, Toledo, O., October 9-11, 1917.

EXPERIMENTAL APPARATUS.

Recognizing that a thermometer placed at the exit of an anesthetizer could not accurately register varying temperatures; that it would be impossible to place one within a rubber bag where the differences in temperature could be read, I decided upon the construction of a metal bag, which, with a glass window through which to observe the thermometer, would permit of the immediate reading of all changes in temperature within the chamber, should any occur. This bag was built, of heavy copper plate, in elliptical form, with two flat sides. The ring, three inches in diameter. Upon this was screwed a brass cap, in the center of which is a glass window, two inches in diameter.

Through the exit in the top was passed a registered thermometer, reading from 32° to 200° Fahrenheit scale. This was attached firmly by brass wire soldered to the top of the bag. (See illustrations.)

I trust that this description of the apparatus will at least be sufficiently comprehensive to indicate that I have spared no pains to make the results obtained certain and conclusive.



capacity of the tank is about five gallons. An eight-inch brass union, so called, is soldered into the bottom, and to this was attached the inlet tubing. At the opposite end of the bag were soldered two quarter-inch unions, one to be used for the outlet and the other as an attachment for a safety-valve of the double acting type. From one flat side there extended into the bag a copper can measuring three inches in length and the same in diameter.

Within this was placed the electric heating element, after all joints were securely soldered to prevent air leakage into the larger can. Immediately above the opening into this heating chamber was placed a brass pipe which leads to a pressure gauge, which is very delicate and was made for this purpose specially, registering, accurately, from naught, or rather from atmospheric pressure, up to an added pressure of six ounces.

Into the other flat side of the bag was a threaded

Through a rubber tube three feet in length I passed nitrous oxid from a 1,250 gallon cylinder into the unheated bag at a pressure of 2 ounces in an atmosphere of 80° temperature, and at the end of 2 minutes the registration of the thermometer had not changed. In 4 minutes, however, it had fallen 5 degrees.

Later, when the material of the appartus had again assumed room temperature, nitrous oxid was again passed through at 2 ounces pressures for 20 minutes. When the experiment was begun the thermometer registered 81°; at the expiration of the 20 minutes it registered 58°, a drop of 22°, or a drop of a little more than 1° a minute for the entire period.

After having turned on the electric current in the warming-chamber until the temperature stood at 130°, nitrous oxid at 2 ounces pressure was passed into the bag for 3 minutes. A drop in temperature of 1° was noted.

With the thermometer registering 130°, nitrous oxid, at a pressure of 2 ounces, was passed into the bag for 10 minutes, and a difference in temperature of 8°, a little less than 1° a minute average, was observed.

That gases compressed greatly, but not into liquid form, assume the temperature of the surrounding atmosphere unless placed in containers of non-heat-conducting material, is a recognized physical fact. For this reason, oxygen in cylinders which have been within doors sufficiently long may be administered in very cold weather, over long periods, with impunity. This I proved by an experiment.

In an atmosphere of 76°, into the unheated apparatus was passed oxygen for 3 minutes, with no resultant change in the position of the mercury in the thermometer.

At the same pressure and room temperature oxygen was flowed into the unheated chamber for 10 minutes without any change. After having passed oxygen into the unheated bag for 25 minutes without any drop in temperature, I felt the indication conclusive.

On passing the oxygen through the apparatus when the thermometer showed a temperature of 125° for 15 minutes, a drop of 2° was shown. This resulted, I presume, from the gas passing into the chamber at a temperature of 76°, depriving its superheated surroundings of some heat units and in this manner reducing the temperature of the bag slightly.

You may note that I was much more liberal in my experiments with oxygen than in those with nitrous oxid. The former I can purchase very cheaply. Not being attached to any public institution, where experimental material seems to cost little or nothing, I cannot afford to be entirely wasteful with nitrous oxid.

CONCLUSIONS.

As a result of these experiments, I would conclude that in very warm weather, for anesthesias of no longer duration than 2 minutes, unwarmed nitrous oxid is equally as good as the heated gas; that in anesthesias lasting over 2 minutes the use of unwarmed nitrous oxid becomes progressively more dangerous with every added minute: that in an atmosphere of a temperature of not more than 70° even the 2 minute period is too lengthy. I have not been able to prove this last assertion, because of the fact that as yet I have not had an atmosphere of 70° in which to make it.

Whenever we heat gases by electric current, we do so by radiated heat. It is a fact that to heat by radiation, proportionately large surfaces coming into contact with the circulating gas or liquid, whatever that gas or combination of gases or liquid may be, are an essential. A gallon vessel of water placed above an open flame coming into contact with the bottom of the vessel through an opening of one-quarter of an inch in diameter would never boil, no matter what the intensity of the heat of the flame. In about the same relative proportions the anesthetic machines which have been devised for us have warming chambers, from the walls of which the flowing gases are heated by radiation, inadequately small.

My earnest plea, therefore, will be that you insist upon being provided with anesthetizers having heating chambers of a sufficient size and a heating element equal to the task of raising the temperature of nitrous oxid, as we use it, to the proper point to make its employment as wholly safe as we can wish and as its great merits as an anesthetic agent so richly deserve.

SOME SUGGESTIONS FOR THE DIETETIC, PRE-OPERATIVE AND AFTER CARE OF SURGICAL CASES.*

F. L. RICHARDSON, M.D.
BOSTON, MASS.

It seems to me that both the surgeon and the anesthetist have had their minds so carefully focused on the technical procedures of the operation and the conduct of the anesthesia that certain other factors in the care of the patient have either escaped their notice or have not received the attention that I believe they deserve. I refer particularly to the dietetic and medical preparation and after care of the patients.

It is necessary to speak of certain conditions and the factors that contribute to their production before taking up the treatment.

Let us first consider postoperative nausea and vomiting, and later postoperative gas and intestinal stasis. We will all admit that these are the things that cause the patient the most discomfort of any part of the surgical recovery. I wish also to call your attention to the effect of preparation on kidney function.

There are quite a number of factors that contribute to post operative nausea and vomiting.

(1) The surgical condition of the patient.
(2) Amount of intraabdominal trauma incident to the operation.
(3) Method of induction and maintenance of the anesthesia.
(4) Preliminary drugging.

* Read during the Fifth Annual Meeting of the American Association of Anesthetists, New York City, June 2, 1917.

(5) Duration of the anesthesia.
(6) Acidosis.
(7) Personal habits of the patient.

(1) Patients who have had intestinal obstruction almost always have nausea and vomiting following the operation even though the obstruction is relieved surgically. This is due, in part, to the surgical condition, but I believe that it is also due, in part, to the fact that they have had an insufficient amount of food. These patients cannot retain, nor is it desirable to give, food by mouth, and it is not often that one has an opportunity of giving rectal feedings before operation.

(2) Wherever it is necessary to handle the abdominal viscera to any considerable extent, especially if the handling is done roughly, we have intestinal stasis for a varying length of time following the operation. This stasis may be so marked as to be practically an obstruction and give rise both to nausea and vomiting and to the collection of gas in the intestines.

(3) The induction of anesthesia should be as rapid as is possible with safety to the patient, thus reducing the amount of saliva swallowed. Where ether is the anesthetic used this saliva contains ether in solution and this is a direct chemical irritant to the stomach. I believe that it is the absence of this factor that accounts, in part, for the smaller amount of nausea and vomiting following gas-oxygen anesthesia.

(4) Morphin preliminary to an operation quiets the nerves of a patient, reduces the time of induction and reduces the amount of anesthesia used by reducing the amount of tidal air. On the other hand it sometimes causes nausea and interferes with peristalsis. When used it is best combined with atropin, which has the advantage of reducing the amount of saliva secreted, so that less saliva is swallowed during the induction period.

(5) All inhalation anesthetics, with the possible exception of nitrous oxid, must be regarded as poisons, therefore the smaller the dose compatible with therapeutic results the better for the patient. This means the shorter the duration of the anesthesia and the lighter the anesthesia the better. Wherever there is a choice between deep anesthesia for a short period or light anesthesia for a longer period I believe that the light anesthetic is to be preferred, provided the surgeon can do his work with equally good end results. The question of whether a deep surgical anesthesia ever cuts off afferent nerve impulses is yet in dispute, there being, what seems to be, good experimental evidence on both sides. It is well recognized, clinically, that deep anesthesia in itself produces a condition quite similar if not identical with shock. It is entirely independent of the amount of blood lost, but of course it cannot be entirely separated from the results of trauma, because deep anesthesia is never produced except in cases where the trauma of the operation makes a deep anesthesia necessary. For this condition I have suggested the term *anesthetic fatigue*. This same condition is present to a less degree in most long anesthesias with slight trauma, and it would seem as if it might be connected with the degree of saturation of the lipoid bodies with the anesthetic.

(6) The question of acidosis in relation to anesthesia is one of the most obscure in the whole realm of anesthesia. It is even a question whether the name acidosis should be applied to the symptom complex as we usually see it. I hesitate to make many statements about the chemistry of this condition, yet it is necessary to say a little to give a more scientific foundation on which to base working formulae. If the present belief is true the chemical substances with which we are concerned come from the breaking down of the fats and to a lesser degree from the breaking down of proteids. We are chiefly concerned with those coming from the breaking down of the fats. Normally sugars assist in the catabolism of the fats and the concentration of the fatty acids in the blood is never excessive. Where there is deficient oxygen supply to the blood or when the amount of available sugar is remarkably reduced as in carbohydrate starvation, substances resulting from the incomplete catabolism of fats are liberated in excessive amounts and excreted in a partly broken down condition. We find them in the urine as acetone, diacetic acid, B-oxabeturic acid, etc. There is also diminished excretion of carbon dioxid by way of the expired air.

With our incomplete knowledge of the cellular metabolism, and physiology of anesthesia, it is impossible to do more than theorize about the effects of inhalation anesthetics on these complicated processes. It seems significant though that all the general anesthetics except nitrous oxid are fat solvents and are absorbed by the fats of the body in a concentration dependent on the concentration of the anesthetic in the blood and the duration of the exposure—the length of time the anesthetic has been given.

In practice the problem is usually still further complicated by a varying degree of starvation, and it is to this particular factor I wish to direct your attention.

It seems to me we are victims of tradition in this

branch of the surgical field as we have been in other branches.

When ether was first introduced it was found that patient vomited following its use. Therefore it was thought that by giving them no food or fluid they would have nothing to vomit. Quite a simple idea, but unfortunately not true. Patients go through the motions even if no food comes up. It was a great step forward when it was recognized that water either before or after the operation in itself did not cause vomiting, but on the other hand there was less severe vomiting if given. It seems to me that it is now time to recognize that food, judiciously given, does not cause vomiting, but on the other hand reduces the amount of nausea and vomiting.

Withholding food is not done entirely on account of vomiting. In abdominal operations it is not desirable to have the intestines filled, yet how often you see emergency operations on patients who have had no sort of dietetic preparation without serious embarrassment to the surgical procedure. Did you ever see serious vomiting in these cases unless there was marked sepsis or obstruction? I think that I can answer this for you in the negative. Is it not sufficient to have the stomach and colon empty if there is no gas in the small intestines? I believe this usually is sufficient.

To have the entire alimentary tract free from food means in itself intestinal stasis, with accumulation of gas from fermentation. Add to this the normal stasis following an abdominal operation and you have enough potential trouble to cause the patient considerable discomfort, and the surgeon some worry.

The question of what food to give before an operation, and how much, is in many ways more a medical than a surgical problem, and it is even a problem for the specialist in medicine. We will consider this more specifically later.

(7) Some people are easily made seasick and some are not. It seems to me that those patients who are easily made seasick in general have more postoperative nausea and vomiting, and for lack of a scientific reason for this I call it the *personal habit.*

Now let us take up the second great cause for discomfort of the patient following operation—intestinal gas and stasis.

Gas is due to fermentation and it is normally present, but the normal intestinal peristalsis prevents the accumulation at any one point and assists in its expulsion. Intestinal stasis then is the thing that makes gas a menace and the problem of gas and stasis may very properly be taken up together.

Stasis is a normal result of an abdominal operation and it has been found experimentally that, in animals, the simple opening of the abdomen without trauma, causes cessation of peristalsis for hours. If you add to this a varying amount of trauma, which is present in all abdominal operations, it may be a considerable number of hours before peristalsis is resumed. Nor are these the only factors. Solid matter in the intestines is one of the normal stimulants to peristaltic movements, yet we do our best to have the patient's intestinal tract free from this normal stimulant, sometimes even by the use of violent cathartics. Certain drugs give rise to a period of intestinal stasis, after a rather vigorous cathartic action; notable in this group is castor oil. It would seem more rational to use a saline cathartic preceded by Russian oil in the few cases requiring drugs and to make the catharsis as mild as possible. The colon, which should always be emptied before an operation, can be effectively evacuated by enemeta, which does away with any interference with normal peristaltic movements of the small intestines.

Another very serious drawback to the use of cathartics the night before an operation is that the patient's sleep may be seriously interfered with, and even where there has been no interference with sleep, a patient who has been vigorously purged feels weak and played out. Who would think of giving an athlete castor oil the night before a race? Yet the patient needs his strength for the operation quite as much as the athlete for the race. There is a scientific foundation for this. Cathartics lower the blood pressure, and if you believe that the lowering of blood pressure is a measure of shock, you have produced shock by catharsis before the operation is begun.

It is not impossible that we may get some aid in dealing with the intestinal problem from changing the bacterial flora either by replanting or by feeding, or more probably by a combination of both.

The effect of ether anesthesia on the kidneys has always caused some apprehension. In this matter much blame has been laid to ether that should have been laid to other causes.

In the past operations have been undertaken on patients without symptoms of kidney disease who have not had a urinalysis and after the operation the discovery of albumin and casts in the urine has given rise to the inference that ether caused the albumin. In not a few of these cases a urinalysis before the operation would have demonstrated the presence of albumin. It is true, however, that some patients who do not have albumin before operation do have it afterwards, and it is also certain that

ether contributes to the kidney irritation. It is also true that ether is only one of the factors that may contribute to this kidney irritation. Here again faulty dietetic preparation and after care may be quite as important as ether in causing this kidney irritation, and one must not forget that the toxins from sepsis are in themselves enough in some cases to cause serious kidney disturbance.

The dietetic preparation of nephritic cases, like the preparation of patients with high blood pressure or diabetes, should be in the hands of a medical man particularly skilled in this line of work if the best results are to be obtained. I do not intend to encroach on his field. It is the preparation of the ordinary case with a view to reducing the strain on the kidneys that we should consider here.

DIETETIC PREPARATION OF PATIENTS FOR OPERATION.

Short Preparation. Operation on 3rd Day.		Long Preparation. Operation on 7th to 10th Day.	
1	2	3	4
Abdominal Operation.	Not Abdominal.	Abdominal Operation.	Not Abdominal.
Food high in carbohydrates and sugars. Low in proteids and fats. Mass small. Saline cathartic if necessary. Forced fluids.	Food high in carbohydrates and sugars. Moderate in proteids. Low in fats. Mass of any size. Cathartic not necessary except for habit. Forced fluids.	Same for both up to last 48 hours. Well balanced diet somewhat high in carbohydrates. Mass large enough for regulation of bowels. Plenty of water.	
For last 48° same as No. 1 except no cathartic necessary.		For last 48° same as No. 2.	

I wish to hold up for special derision the ether breakfast consisting of consomme or broth, so commonly used in the past. Consider for a moment what this breakfast does and what it is expected to do. To begin with it has no nourishment. Consisting as it does almost exclusively of extractives which have to be eliminated by the kidneys, it throws a strain on organs which will be highly taxed and irritated by ether. It does not relieve the thirst because of its high salt concentration, and it does not satisfy hunger. The one useful thing that it does is to supply a little water. Better by far to give a little plain or aerated water without these extractives.

Some special conditions require quite different dietetic preparation. Take for instance a case of appendicitis that has been watched for some days and treated medically, or a gastric ulcer that has been on a greatly restricted diet. You all have seen such cases have an unexpectedly stormy convalescence, out of all proportion to the pathological process or the nature of the operation. In such cases it may not be desirable to change what the patient is getting by mouth but there is no reason why such patients should not be fed glucose or dextrose by rectum before as well as after the operation.

Hogan in a very enlightening paper published in 1915 has called attention to the principles and theory of such preoperative care and it is only necessary to call your attention to his work. Fortunately, and as we should expect, the same dietetic preparation which gives the best results in reducing vomiting and intestinal stasis, also give the best results in conserving kidney function.

What can we hope to gain by proper attention to the dietetic preparation of the patient? We can expect to maintain the nutrition of the patient at a higher level, thus conserving his strength for the important event, and for recovery from the loss of blood and shock incident to the surgical procedure. We can expect to have less discomfort from intestinal stasis with the consequent collection of gas. We can expect to reduce the interference with kidney function.

The diet for a day or two before operation should contain plenty of carbohydrates and sugars, a moderate amount of proteid and but little fat. The mass should be small.

The accompanying chart shows the principles on which the diet should be founded.

Let us now consider the after care of our cases. Water by mouth in any reasonable quantity, preferably hot. I believe that there are no cases in which it is advisable to withhold water, although it may be necessary to restrict the quantity for a few hours. Where the patient has been on a restricted or improper diet, the addition of sodium bicarbonate or sodium citrate is beneficial and should always be given to children who seem more prone to develop acidosis than adults.

If for any reason the diet has been restricted before operation or cannot be begun reasonably soon after operation nutrient enemeta of glucose or dextrose should be given, remembering that these enemeta cannot be continued without an occasional cleansing enema.

Food by mouth should be started in many cases much earlier than is the custom. Some of the prepared foods consisting largely of maltose may be given quite early and although they contain relatively little nourishment because of the small quantity given, the nourishment is in such a form as to be readily available for the body needs. Milk alone does not seem to me to be a desirable form of food, though perfectly proper if mixed with thoroughly cooked gruels.

Diet is no panacea. It can not be expected to entirely eliminate all the unfortunate symptoms following anesthesia and operation. There are too many factors in their production to expect that, but it is another addition to our treatment in safeguarding the patient.

THE USE OF NITROUS OXID-OXYGEN IN LABOR.*

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The use of nitrous oxid-oxygen in obstetrics has been discussed for several years. We are now better informed as to its merits, and I feel sure that it will occupy a very important place in this branch of medical practice.

The unfortunate discussion of *Twilight Sleep* during the past few years has tended to discourage any new methods that might be devised to relieve a woman's suffering during labor.

When there is a necessity for the prolonged use of an anesthetic, nitrous oxid should be selected. I am sure there is no particular agent that would fit each and every case. In normal cases where the relief of pain is indicated, I am partial to gas-oxygen.

The introduction of anesthesia for the relief of pain incident to any operative procedure is most important. This is especially true of childbirth. Sir James Y. Simpson in 1847, speaking in defense of painless labor, said that *"pain in excess is destructive, and even ultimately fatal, and the great pain accompanying parturition is no exception to this pathological law."*

If this be true, is it not demanded that we shall employ the best means at our command to relieve the pain of childbirth?

* Read during the Joint Session of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917.

HISTORICAL CONSIDERATIONS.

In former years many reasons were advanced by laymen and others against the employment of such agents, and even today there are those who deny the necessity of ameliorating the pain of childbirth. But notwithstanding this, many drugs have been used for this purpose, each of which has had its supporters. The ideal agent still is unknown.

Simpson thought that the pain of parturition could be lessened by anesthesia without interfering with the natural course of labor. This he accomplished in 1847 when he was accoucheur to the first woman ever delivered under the influence of an anesthetic.

In the fall of the same year he began the use of chloroform, and from the year 1853, when it was administered to the queen of England, the use of chloroform stood out supreme.

During the same year Dubois of Paris, and Morton and Keep in Boston employed the inhalations of ether during labor. Pajot in 1854 wrote of the advantages of chloroform inhalations for the relief of pain. Then in 1878 Pinard wrote an elaborate monograph entitled "The Comparative Action of Chloroform, Chloral, Opium and Morphin on Women in Labor." This was a masterpiece of the early writers, and many of his deductions remain unchallenged.

He demonstrated that chloral was absolutely of no value, and that morphin was only an adjunct of other drugs.

It then remained for Paul Bert in 1878 to suggest that nitrous oxid combined with oxygen was the ideal anesthesic in labor, and in 1880 Klikowitch of Petrograd demonstrated its efficiency in the pain incident to labor.

In Edgar's edition of Winckle in 1890 we find some observations which foreshadow our own of today.

UNSATISFACTORY REPORTS.

The unsatisfactory reports that were heralded as a *knock-out blow* to nitrous oxid probably were due to the lack of development of a proper apparatus. My own experience in over one hundred cases has yet to cause me the least bit of alarm, and I can add that reports from other obstetricians are practically the same.

The period of application varies from a few minutes to hours. Our best results have been obtained where the gas has been given *skilfully*. It has been proven beyond any reasonable doubt that when the proper care has been exercised we notice no ill effect either to mother or babe.

SYSTEMIC EFFECTS.

The effect of gas upon the system varies with the amount given. Circulation and respiration are but little disturbed and the blood pressure is but slightly increased. Quite recently I have seen it act as an *antispasmodic* in a very nervous primipara. The cases where we have an increase in the cardiovascular function are those in which a great deal of gas has been given.

During the past two years wonderful strides have been made in the practical use of analgesia. In the production of analgesia (a phase in which we are most interested), one sees little out of the ordinary. The rule is a normal pulse rate and respiration.

ANALGESIA.

What do we mean by analgesia? It is the loss of the sense of pain perception without the loss of the sense of touch or general consciousness. It is brought about by the depression of the centers of the pain perception; its intensity depends largely upon the size of the dose administered.

Nitrous oxid is an ideal agent for this effect. Patients may still retain their mental faculties during analgesia, and it is very rarely necessary to administer gas until there is complete inhibition of the pain centers.

The mucous membrane is very slightly congested under a prolonged application of gas oxygen, the gastro-intestinal disturbances are uncommon, slight vomiting and a mild distension being the only symptoms of any import.

Gas-oxygen is applicable in delivery because we have all the normal functions of both the voluntary and involuntary muscles undisturbed. This condition wards off postpartum hemorrhage. The picture is quite different when chloroform or ether is used.

When nitrous oxid is properly administered the patient shows very little exhaustion, the postpartum condition is most favorable, and everything points to a speedy convalescent. During the administration of gas the fœtal heart should be listened for, every half hour. I think it is well to have the patient very quiet, partake of little food, and drink little.

ADVANTAGES.

The advantages of nitrous oxid over the so-called *Twilight Sleep* are:

1. A shorter second stage; the patient using all her voluntary efforts to expel the babe.

2. A very even relaxation of the muscles; minimizing the dangers to perineal tears.

3. A total absence of restlessness and rigidity, which bring about lacerations.

4. The rapid return to normal after the mask has been removed.

After careful study I offer five reasons why gas-oxygen is the most valuable analgesic in obstetrics:

1. Practically the whole second stage is painless.
2. There is an absence of exhaustion.
3. There is a diminution in postpartum psychoses.
4. There are fewer lacerated perineums.
5. Better babies.

Experiments have shown where the mother is healthy there can be no disturbance to the secretion of her milk. The baby is absolutely normal if all other things are equal.

Convalescence, where there has been a long hard labor, is usually rapid. This of course depends entirely upon the nature of the delivery. Involution is completed as usual and the patient requires very little care.

RESULTS IN DIFFERENT PATIENTS.

The patient usually takes gas very readily, and with each uterine contraction there are all the evidences of normal labor, the head is pushed farther and farther down and is finally born without the semblance of pain. It is true that some patients claim more relief than others, multiparae being better satisfied because they have had their experiences under the old method of terminating labor. The ordinary multipara will tell you there is no comparison in the treatments. Other things being equal I think it will be agreed that we are warranted in doing everything in our power to please the patient.

It is very poor policy to demand early narcosis; it is much better to explain to your patient what analgesia means. Very few patients fail to respond, and in my experience I recall but one. If we should base our opinion upon postpartum discussion there would be a high rate of satisfied mothers.

I think that we all agree that pain is greatly reduced but not entirely absent. We must study each individual case, watching the expression of the mother, and also noticing the movements of her extremities. I have known women to cry out and groan, but later say: *"It did not hurt. I was only afraid that it would."*

Many errors in the end-results, with gas-oxygen analgesia, come from an unskilled application. The gas should be administered in small doses, gradually leading up to a point where the patient becomes satisfied. With this accomplished, you will have her co-operation.

EFFECTS ON THE BABE.

Nitrous oxid has no ill effect either directly or indirectly upon the babe. It has been proven that it is not transmitted to the babe in utero.

The administration of nitrous oxid should begin at the first sign of pain, and the mother should receive the most gas at the height of each contraction. At this time a great deal of gas is entering the blood, the uterus being in a state of high contraction with very little interchange of maternal and fœcal blood. During the period of relaxation there may be a slight interchange of blood, the blood of the fœtus receives very little nitrous oxid, and by the time relaxation is complete the mother's blood becomes well oxygenated.

In producing analgesia the dose is so small that it would be quite harmless if given directly to the infant.

We have had very little need for artificial respiration; the majority of the babes cry out immediately after delivery.

TIME AND DURATION OF APPLICATION.

The time of application varies greatly, each practitioner having his own idea. Gas-oxygen may be given for many hours without any ill effect. Our longest period was between three and four hours and we noticed little change in the patient's physical or mental condition. Where the mother has suffered for several hours before the administration we find evidence of exhaustion and sometimes syncope. When used late, especially in the class of *highly neurotic* patients, our end-results are not so satisfactory. It is much better to begin early. It may require a little more time, but in the end one is quite sure to be better pleased.

EFFECTS ON PROGRESS OF LABOR.

Gas controls the progress of labor in a way peculiar to itself. That the second stage of labor is shortened, there can be no doubt. I am positive that its effect upon the first stage is nil. Do not expect to have a quiet patient when gas is administered late.

When given for its analgesic properties it relaxes the muscular fibers to a degree comparable to normal sleep.

Labor pains do not require as much as would be deemed necessary for surgical interference. Analgesia depends entirely upon the amount of gas absorbed. In the average case our mixture approximates 90 per cent. gas and 10 per cent. oxygen.

The nerve centers presiding over the five physical senses are affected one at a time in recognized and constant sequence. The sense of touch or feeling is the first to disappear and the sense of hearing is the last. A state of analgesia commences with the suppression of the nerve centers affecting feeling and continues progressively until the last and most acute sense has been suppressed, when anesthesia has been induced. The patient remains susceptible to suggestions long after the sense of touch has been put out of commission. Because of this, the patient will carry out her part of the program more satisfactorily at any time after analgesia is well established.

Our best results are with women of natural intelligence, not necessarily highly educated, but with good, sound, common sense. Those who give us the most trouble and who fail to carry out their part of the plan are the mentally indolent class or those with sluggish minds. A highly nervous and irritable woman may trouble you at the start but after she has become acquainted with the surroundings you may be able to induce a fair degree of analgesia.

With a primipara the practitioner meets with an occasional disappointment, simply because she never has suffered the pains of a previous labor. Some excellent results have been derived after the patient has been in labor for a while, where one can implant an idea of the advantages that are derived from the administration of nitrous oxid. Occasionally you will meet with one of those lazy, indolent multipara with a large rectocele and cystocele who will not give you any help whatever.

First deliveries under any ordinary system are considered nerve wracking. Our most satisfactory results, of course, are obtained with the multipara, for after having suffered in previous labors they are very grateful to their attendant for having reduced their suffering to a minimum.

ALKALOIDAL ADJUVANTS.

The use of the different therapeutic agents in connection with gas oxygen is a theme of great interest. I formerly used a method employed at Freiburg with indifferent results.

Morphin if given quite early will act as a sedative during the *first* stage, but when given late in this stage or early in the *second,* it is apt to do irreparable damage to the babe. It should be given at least six hours before the delivery; if given too late the babe is apt to be born with its respiratory centers so blasted that it is very difficult to resuscitate. I have seen several cases of asphyxia livida, which I am sure were the result of the late introduction of the opiate.

Morphin depresses the sensory centers and sometimes causes an unnecessary delay in the beginning of the case. If given in large doses like 1-4 gr., the mentality of the patient is sometimes impaired. This is a condition that we try to avoid. When the pains are severe I prefer to depend upon the gas itself.

It is true that in highly nervous women where pituitrin has been used to decrease the frequency of the contractions, morphin and pantopon can be used with some degree of success.

RELAXATIONS OF THE PERINEUM AND LACERATIONS.

We have had very few cases of perineal lacerations where analgesia or anesthesia has been in-

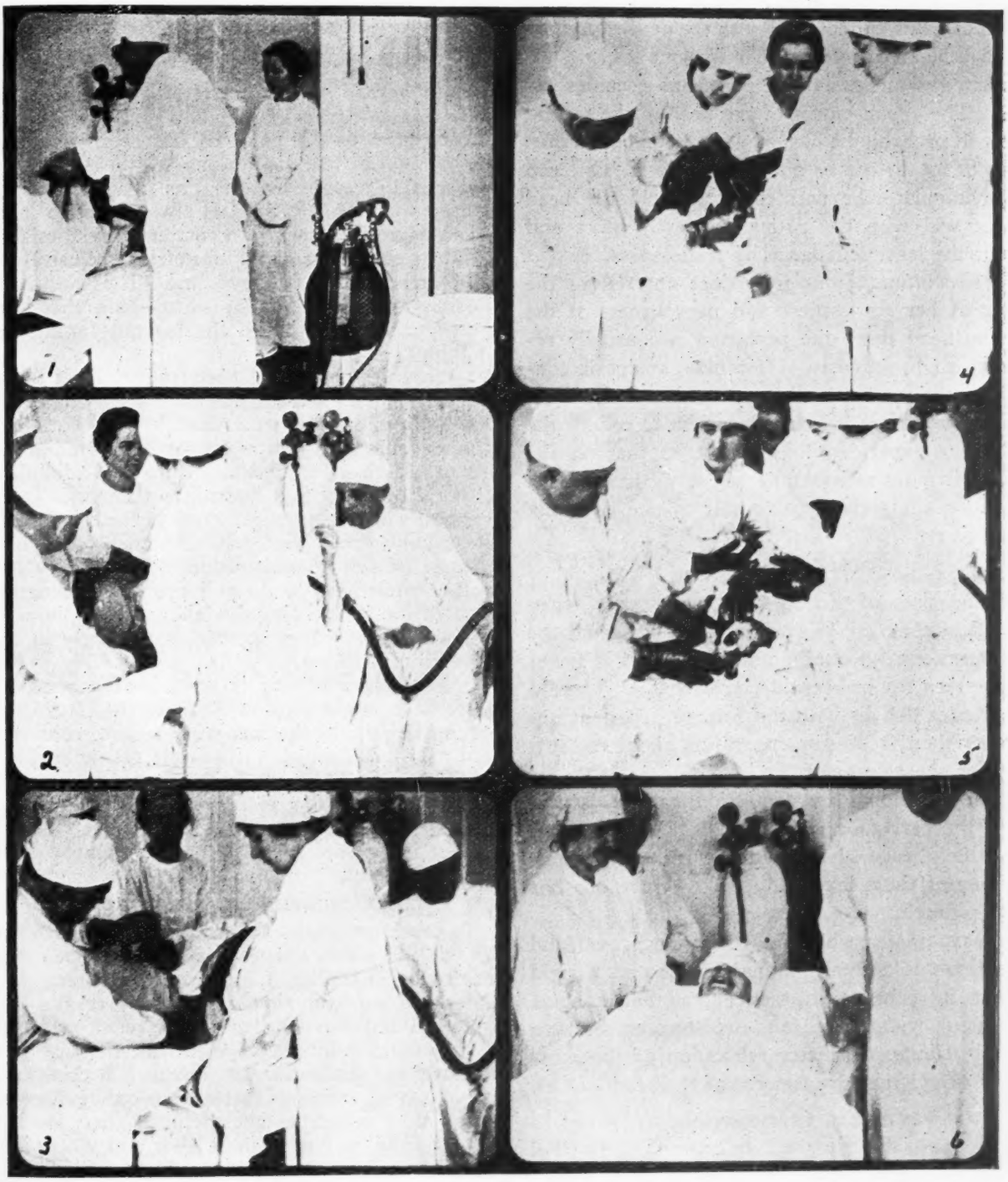

Fig. 1—Patient being placed on table for delivery.

Fig. 2—Patient signaling with her hand for gas-oxygen in advance of pain.

Fig. 3—Rupturing the membranes.

Fig. 4—Author's method of stretching the perineum and supporting it to prevent lacerations.

Fig. 5—Child being born, pink, and crying lustily immediately.

Fig. 6—Patient after childbirth, smiling and happy, and receiving congratulations of attendants.

duced. When no anesthetic is used, especially in a primipara, the mother more or less loses control when the head is coming through. If we are able to lessen her suffering, relaxation comes almost involuntarily. She will throw into activity all of her expulsive power and the operator then can have control over his patient, and with the proper precautions will be able to deliver her without a tear.

Under gas analgesia the perineum becomes relaxed. The advancement of the head in the second stage will probably be hastened by the patient's own efforts or by the use of pituitrin, or both. One can then manipulate the perineum and hold the bead back at will with the patient perfectly quiet and without the least semblance of restlessness.

When *continuous analgesia* does not relieve the patient of her restlessness and nervousness at the time the head is on the perineum, we usually resort to a slight narcosis. Of course, analgesia controls the patient better than narcosis. This is especially true where it is just sufficient to relieve the pain. Our experience has taught us that on the whole it is more satisfactory where we have had a continuous analgesia for one-half to one hour before delivery.

FORCEPS AND ETHER.

If the use of forceps is necessary, when one wishes complete relaxation, I do not mind the administration of a small amount of ether. I never yet have seen any bad results come from it. I would much rather deliver with the forceps a patient under ether than to do some operation about the soft parts, for the release of the head.

Analgesia affords no protection against laceration to the cervix or vaginal walls. This is especially true when we have to deal with uterine inertia in one of those lazy multiparaes where one has to give pituitrin.

To recapitulate: when the forceps are used and where there is a small vaginal orifice and a rigid perineum it has been our practice to administer some ether, along with the nitrous oxid-oxygen, because ether contributes a greater relaxation of the muscles and delays the advancement of the head.

PERINEAL INFILTRATION.

As to the use of local anesthesia I have little to say. I have used novocain hypodermically into the perineum with very little result. It must injected at the proper time and where the head is low we oftimes find it necessary to reinfiltrate.

This situation demands a technic a little worrisome when we do not know exactly how much of the drug has been absorbed.

Infiltration must be employed before the perineum becomes distended. Of course novocain can have no effect upon the infant. Unfortunately for this drug it is not safe to use where there is a tardy descent of the head, and these are the cases in which it should be used.

With small vaginal outlets and a rigid perineum there is nothing that so quickly relieves the pain as the gas-oxygen analgesia.

COMBINED ANESTHESIA FOR REPAIRS.

With regard to all obstetrical operations, like perineal repair, it is advisable to give ether with the nitrous oxid to the point of narcosis. There are minor repairs like lacerations of the first degree that can be repaired under gas. When analgesia is used for such repairs it is always best to induce it to a degree, bordering on complete anesthesia.

When one is practicing obstetrics exclusively, he must accept cases as they come. It is not always possible to determine the status beforehand and therefore we must be on the lookout for all sorts of things.

I recognize that some obstetricians have to face the problem of self-administration of gas. With this I have had no experience. Our work is so situated that the services of an expert anesthetist are at all times available. With self-administration I should say that intermittent narcosis is safe because when the patient once becomes anoxemic she usually drops the cone. Another possible advantage of self-administration is that it gives the mother something to do and probably strengthens her will for terminating the labor, but on the whole it is an unsatisfactory method, particularly in dealing with primiparae.

Continuous analgesia is sometimes necessary in order to secure best results. When the contractions become rapid and the pain very severe, continuous analgesia is indicated. It affords greater relief to the mother and she can be controlled more easily. Continuous narcosis is only demanded where an obstetrical operation becomes a necessity. Once in a while it becomes useful in quieting a high-strung, nervous patient.

FATALITIES UNDER NITROUS OXID.

To touch on deaths under nitrous oxid is to open one of the moot questions of anesthesia. After careful consideration I am prepared to say death under nitrous oxid almost invariably results from asphyxia and asphyxia need not result when gas is administered by a competent anesthetist. Even in cases of cardiovascular diseases I think it is agreed among surgeons that nitrous oxid is less dangerous than any other anesthetic. Where we have this condition to deal with in labor and where it becomes necessary to resort to anesthesia it is the part of wisdom to end labor as quickly as possible and in as easy a manner as possible. Blood pressure changes very little during analgesia, probably only from five to ten millimeters. It mounts very rapidly with the occurrence of cyanosis. Herein is the danger with a degenerated myocardium which renders the patient liable to apoplexy or acute dilatation of the heart. In such cases it behooves the operator to stay away from the asphyxial stage.

SACRAL ANESTHESIA.*

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In 1913, we first published the results of our trial, in some twenty cases of sacral anesthesia. At the time we were ignorant of the fact that Cathelin, Stoeckel, Loewen, and others had been employing this method with marked success.

We first adopted this form of anesthesia in our search for one other than hypodural, to prevent shock in the combined operation for cancer, where the upper rectum and sigmoid were involved.

Satisfied with our results, we extended the scope of this procedure to embrace operations on the perineum for hemorrhoids and other conditions, finding that a minimum of discomfort and danger followed.

Considering that sacral anesthesia enjoys safety, increases efficiency, and produces few after complications, it is surprising how seldom it is employed.

One frequently reads of the employment of hypodural anesthesia for hemorrhoids. We took exception to this many years ago, as being fraught with danger that was out of the proportion to the gravity of the operation. We, in our turn, were taken to task by men employing the hypodural method, claiming that their way was quite as safe as any other form; but I notice that the men then loudest in their praise of this procedure are no longer using it. More than one of our colleagues who were very keen on spinal anesthesia, has now abandoned it, realizing its grave dangers.

I do not wish to convey the impression that I am comparing the usefulness of hypodural with extradural anesthesia. That is far from my purpose. Both have their field of usefulness. But, within its special scope, there is no comparison from the standpoint of safety between hypo- and extradural anesthesia. Nor do I wish to be understood to be advocating sacral to the exclusion of local or general anesthesia. There are indications for each, and the surgeon of experience will instinctively select the proper one.

Sacral anesthesia consists of the injection of an anesthetizing solution such as novocain or cocain into the intradural space through the sacral canal. It is purely a conductive anesthesia, by which more or less extensive complex of sensory nerves are interrupted. It will act upon the spinal nerves after they have left the dural and so block all sensory impulses. Cathelin, the great French surgeon, was the first to demonstrate the possibilities of this method. He injected three cc. of a 1 per cent solution of cocain into the sacral canal of a dog, resulting in a complete anesthesia of the whole body.

Encouraged by this experimental work on animals, he applied the same procedure to man, meeting with disappointing result, the experiment being a total failure. However, he was not discouraged. He continued his efforts, confined himself to various neuropathologies, such as pelvic neurosis, neuralgias and incontinence of urine, and in over a thousand cases obtained good results. Stoeckel, learning of Cathelin's work, immediately perceived its value in obstetrics. He modified Cathelin's technic somewhat and succeeded beyond his expectations in reducing the pain of labor and also found it helpful in relaxing the perineum in eldery primipara.

Loewen, in 1910, followed Stoeckel; then came Schlimpert, Schneider, Koenig. Each added his quota in exploring and developing this field. They believed that its usefulness could be extended by increasing the amount of the solution and adding adrenalin and bicarbonate of soda and also by using a much longer needle. By these methods and by the addition of narcotics, they were able to perform abdominal operations. This they termed high extradural anesthesia. It would seem as though they had gone a bit beyond the legitimate field and that it would be much better to adopt some other form of anesthesia in laparotomy. We further believe that by developing the legitimate field of sacral anesthesia, great things can be accomplished. Wilms recommends the injection of 20 cc. of saline, before injecting the novocain; and believes that by following this method, the novocain absorption is limited, and better local anesthesia is obtained. Strauss suggested the addition of sodium sulphate, to prevent the decomposition of adrenalin.

ANATOMICAL CONSIDERATIONS.

There are a few anatomical features worth considering. *First,* the conformation of the sacral canal and the posterior surface of the sacrum. *Second,* the gross anatomy of the lower spinal cord and sacral roots.

The Sacrum.—The posterior surface is composed of the fused laminæ and their modifications. The upper borders of the first laminæ slant downward, and below their junction is a well-marked spine. Below this the laminæ of the sacral vertebræ are fused and the spines small. The lam-

* Read during the Fifth Annual Meeting of the American Association of Anesthetists, New York City, June 2, 1917.

inæ of the fifth sacral *never* join, and those of the fourth frequently do not. This *is the important* point, for thus it leaves the lower end of the canal uncovered. This is the sacral hiatus, and the place through which we inject the anesthetic.

The laminæ that do not meet end in tubercles, each representing, of course, one-half of a spinal process. The lower two project downward at the sides of the open canal, and are called the sacral cornua. Right below this, in the median line, is the base of the foramen, and oftentimes a bony knuckle, the sacral coccygeal junction or articulation.

The Sacral Nerves.—The spinal cord terminates as such in a pointed end—the sonus medullaris that usually ends opposite the discs between the first and second lumbar vertebrae. The dura mater of the cord, however, continues and extends to the level of the second sacral vertebrae. From the third lumbar vertebrae down the lumbar and sacral nerves pierce the dural sheath till they reach their individual foramina and leave. These nerves run a varying distance through the canal—depending upon their destination; they are supported by a loose cellular tissue and are enveloped posteriorilly by a thin diffuse anestomosingvenous pampinniform plexus.

EXTENT OF ANESTHESIA.

A consideration of the nerves affected and the regions supplied, shows that the conduction of the ano-coccygeal root nerves, the fifth, fourth, third and second sacral nerves, are affected. These nerves cover an extensive area and form many large plexuses and complexes and nerve centers which are in close harmony with the ever-present great sympathetic. The upper extent of anesthesia and nerve blocking depends purely upon three factors, (1) amount and concentration of the solution, (2) posture, and (3) disposition of the anesthetic. If the patient's pelvis is raised, if a very potent amount of solution be injected, and if the needle be inserted very high, it is possible by the sacral route to anesthetize even the fourth and fifth nerves.

In the low extradural anesthesia—the ordinary type—the nerves affected are the coccygeal nerves and the nerves derived from the coccygeal plexus, namely, the pudic, the inferior hemorrhoidal and the perineal and the dorsalis penis, or clitoris. In addition, the visceral branches of the third and fourth sacral nerves which are distributed as the middle hemorrhoidal, the inferior vesicle and vaginal nerves to the rectum, bladder and vagina, respectively, are also interrupted.

Sometimes the external and internal popliteal are touched by the anesthetic, leading to parathesias and hypesthesias of the legs and feet, and the small sciatic. These are purely accidental. The pudenal plexus is affected the most. It is formed by contribution from the first, second and third sacral nerves, and from the entire anterior primary division from the coccygeal nerve.

As a rule, isolated nerve trunks are also affected, and it was this phenomenon that caused Stoeckel to apply it in obstetrics. He called attention to the flaccid floor of the pelvis after extradural anesthesia. The relaxation of the sphincter, and is particularly useful in some surgical operations.

With the nerve distribution in mind, it can readily be seen that with perfect anesthesia any pelvic, perineal, rectal or bladder operation could easily be done.

The method we follow has been developed within the last four years by ourselves and by those we have mentioned.

TECHNIC.

We find it best to employ a glass syringe which holds about 20 cc. and which fits comfortably into the needle such as is generally used in hypodural anesthesia. One of our assistants had a serious accident when introducing the needle, about three centimeters of the end of the needle remaining in the canal after the needle was withdrawn. Since then we have employed a platinum needle. When we speak of a needle, we mean a very fine trocar and canula, like that used in spinal anesthesia. After the trocar is removed, the canular can be passed through the canal without injuring the veins, which lie in the loose tissue within the canal. Furthermore, there is less danger of penetrating the dura, as happened to us on two occasions by using the needle we have just described. Some of our European colleagues introduce the needle when the patient is in a sitting posture. We prefer the left Sim's position.

ANATOMICAL LANDMARKS.

We have examined a number of cadavers, and taken measurements at different points, to establish, if possible, a fairly accurate method by which the opening of the canal can be located. At first measurements were taken from the posterior superior spine of the ilium to the tuberosity of the ischium on both sides, but the bi-section of these lines did not come anywhere near the opening. The next measurements were taken from the posterior superior spine of the ilium to the left margin of the sacrococcygeal joint, and the same on

the other side, and we found the opening of the canal in the majority of the cases, to be where these two lines bisect. Here inject one or two cc. more, and this is made much simpler if the needle has been left in place.

PRECAUTIONS.

It is important for the fluid to be absolutely sterile and freshly prepared; also of the same specific gravity as the blood, in order that it may be readily absorbed.

After anesthesia is established the needle is withdrawn, and some cotton and collodion placed over the wound. The patient is then placed in whatever position is desirable in order to perform the operation, and the rest of the procedure depends upon what particular operation has been undertaken. If a prolonged anesthesia is necessary, urea and quinine may be substituted for cocain. I have not as yet determined how much urea and quinine is necessary in order to produce complete anesthesia, or what would be the duration of the anesthesia under this procedure. I shall work this out later on.

EXPERIENCES.

We have used this method of anesthesia in eighty different cases, and in all but sixteen cases the anesthesia was perfect and all that could be desired. One case in particular was very interesting. The patient was a young man, twenty-three years of age, with a carcinoma involving the prostate and rectum. We were able to dissect the rectum and remove the prostate with absolutely no pain. However, when the dissection was almost completed and we were ready to separate the rectum from the peritoneum we encountered some pain and pronounced shock when pulling on the rectum. He also had severe pain when an attempt was made to cut the peritoneum with the scissors. Before proceeding further we had to give the patient a general anesthetic in order to complete the operation.

From this case we learned the lesson that operations involving the peritoneal reflexion are impossible with sacral anesthesia. If I had used my usual procedure of blocking the hypogastric ganglia above I could have completed the operation without further pain. The shock which occurred when I pulled on the peritoneal reflexion was due to pulling on the lumbar and inferior mesentric plexus of the sympathetic, and to the fact that we had not blocked this point.

The other cases were operations involving the rectum only, and all were accomplished with the greatest ease to the operator and comfort to the patient. In no instance did we use more than 10 grains of novocain, and that amount was used in the operation which involved the removal of the rectum and the prostate. The point of interest in connection with this case is worth mentioning. Before dissecting the rectum free from the urethra and removing the prostate, one of my assistants tried to pass a sound into the bladder. Some difficulty was experienced on account of a posterior stricture. After gentle manipulation we succeeded in passing the sound into the bladder, and during all of this procedure the patient had not the slightest sensation of pain or discomfort.

SPECIAL UTILITY.

The value of this method, therefore, in cases of stricture of the urethra in hypersensitive individuals in whom it is necessary to explore the urethra or the bladder can easily be understood. Especially will it be found serviceable in old men on whom it is necessary to do a prostatectomy, or in any procedure involving the urethra or bladder. It finds its greatest field of usefulness in cancer involving the rectum and sigmoid, because here we can completely block the sympathetic by a combination of hypogastric and sacral anesthesia. In protracted and intractable pruritis great relief can be obtained by this method of anesthesia.

CONCLUSION.

In conclusion, we would ask that this comparatively old, but seldom used, method of anesthesia be given a more extended trial in suitable cases, so that the limits of its usefulness can be determined.

THE AMERICAN ASSOCIATION OF ANESTHETISTS WILL MEET IN CHICAGO JUNE 9-10, ON THE EVENINGS OF THE CLINIC DAYS OF THE AMERICAN MEDICAL ASSOCIATION. OWING TO THE UNTIMELY DEATH OF DR. F. W. NAGLE, PRESIDENT, DR. ALBERT H. MILLER, OF PROVIDENCE, R. I., WILL ASSUME THE DUTIES OF ACTING PRESIDENT, AND ON ACCOUNT OF CAPT. J. T. GWATHMEY'S ABSENCE ON SERVICE IN FRANCE THE EDITOR OF THE SUPPLEMENT HAS TAKEN OVER HIS SECRETARIAL RESPONSIBILITIES.

AN INTERESTING AND INSTRUCTIVE SCIENTIFIC PROGRAM IS BEING ARRANGED. DURING THE CLINIC DAYS CHICAGO ANESTHETISTS WILL DEMONSTRATE MANY OF THE ROUTINE AS WELL AS THE NEWER METHODS OF ANESTHESIA AND ANALGESIA. AN ADDED ATTRACTION WILL BE A SYMPOSIUM ON SHOCK BEFORE A JOINT SESSION OF THE SECTIONS ON SURGERY AND PHYSIOLOGY AND PATHOLOGY. IT WILL REPAY YOU TO ATTEND.

REFORMING THE SURGEON.*

CHARLES H. GALLAGHER,
ITHACA, N. Y.

One of the most astonishing things I know is the capacity of the *average* surgeon to resist the advance of the art of anesthesia. In the hands of a large and ever-increasing number of men this art has attained the dignity and shouldered the responsibilities of a full-fledged specialty.

Improvements in anesthesia have done more than any other thing to lessen surgical mortality since the discovery of asepsis. The surgeon has too willingly accepted the blame for anesthesia faults and failures, masquerading under the name of surgical shock, and it is not to his credit that he has failed to put the blame where it belongs.

The duties of the anesthetist should begin as soon as the operation is decided upon. The actual administration of the anesthetic is not the most important of these duties.

Up-to-date anesthesia produces results far better than the old methods. Everyone present knows this to be true, but it seems to be still necessary to convince the average surgeon of this fact. I agree with Dr. Albert Miller that a uniform system of records, adopted by this Association, and the results of a very large number of anesthesias tabulated under a standardized form, would be the best way to educate some surgeons as to the better results of modern anesthesia of which he may and should avail himself. These records should consist of three parts.

The *first,* filled out before the patient is brought to the operating room, should contain all the facts relating to the physical, functional and mental condition of the patient and the operative procedure to be undertaken, from which the skilled anesthetist will be enabled to decide as to the best pre-anesthetic preparation and medication, and the best anesthetic drug to be used and the method of its administration.

The *second* part of this record, filled out in the operating room, should cover all the details of the administration of the anesthetic, including such details of operative procedure as have a direct bearing on the anesthetic and post-anesthetic conditions, as hemorrhage, traumatism and handling of certain organs.

The *third* part, filled out after the operation, should contain the proof we are after—*that we can furnish the surgeon better results, better recoveries, less nausea, nephritis, pneumonia, hepatic necrosis, uremia,* with expert anesthesia.

Remember always that there may be causes not connected with the anesthesia for untoward conditions, and accurate observations and notes before and during the operation may determine causes for which the anesthetist is not to be blamed.

The great advance in the methods of administering anesthetics in the last few years has been largely due to improvements in the mechanical appartus used for controlling, mixing, and administering the various anesthetic agents.

The selection, proper care, use of this apparatus places the anesthesia still farther from the control of the surgeon and puts more responsibility upon the anesthetist.

The various systems of anesthesia now in use and producing the best results require such careful control and adjustment of the gases or vapors used and the effects are so quickly noted and changes so quickly made that no one but the anesthetist is or can be in close enough touch with the signs to judge what changes are necessary, and when.

It is plain that the surgeon is here accepting the responsibility for something that is beyond his control.

To secure the best results there can be no predetermined amounts or percentages of any anesthetic drug or mixture or time of the different stages of an anesthesia, for, after all, the scientists and inventors are through, the patient is the final and only gauge of the proper amount and proportions of any anesthetic or anesthetic mixture. This point should be considered in the selection of apparatus. Induction is as important as any other step, and here again the anesthetist should not have any predetermined figures set for him. Each case makes its own rules. Smoothness is worth more than speed.

The most rapidly eliminated anesthetic causes the fewest after results and requires the most care in administration.

While convincing the surgeon that the new anesthesia offers many advantages over the old, he will gradually arrive at the conclusion that anesthesia has become a subject so broad and deep that it is absurd to think that its selection, preparation, conduct, and after care, can be directed by anyone who is not specially trained for the work, and who cannot give his undivided attention to the details of the anesthetic phenomena.

Some recent court rulings tell us that the surgeon is in full charge of the anesthesia and the responsibility connected therewith is wholly his. Possibly the surgeon has no recourse but to accept this

* Read during the Fifth Annual Meeting of the American Association of Anesthetists, New York City, June 2, 1917.

state of affairs to a certain extent on account of the limited number of qualified professional anesthetists, but the time will come when he will wish to avail himself of the newer and better forms of anesthesia, and he will then realize that he is as unqualified to decide and direct the various steps of a proper anesthesia as he is to issue orders to his roentgenologist, or his occulist, or his laboratory expert, as to the methods which they shall use to produce the desired results.

Even beyond this lies a further lesson and opportunity for the surgeon. A prominent member of the profession has said that he can spoil the best anesthesia given by his conduct at the site of the operation. It is true.

A surgeon whose technic is such that his patients have to be given a larger dose of the anesthetic drug than would be required with a technic modified in certain particulars, and producing equally good results, should be willing to so modify his technic that a minimum amount of anesthetic could be used, thereby lessening in a direct ratio all the dangers and discomforts of anesthesia.

This course would redound directly to the benefit of the surgeon and the patient.

A thorough co-operation between the surgeon and the anesthetist is absolutely necessary to the working out of the proper technic required to enable the surgeon to avail himself, for the benefit of his patient, of the very best results in anesthesia.

I wish here to make an earnest plea for this co-operation which means so much for both the anesthetist and the surgeon, and to assure the surgeon that he will then receive a most gratifying measure of appreciation from both the anesthetist and the patient.

145 COLLEGE AVENUE.

THE INTERSTATE ASSOCIATION OF ANESTHETISTS WILL MEET IN INDIANAPOLIS, IND., SEPTEMBER 25-27, IN CONJUNCTION WITH THE INDIANA STATE MEDICAL ASSOCIATION. THIS WILL BE ONE OF THE MOST INTERESTING AND ENJOYABLE MEDICAL MEETINGS IN THE MIDDLE WEST THIS YEAR, AND ALL THOSE, WHO ARE INTERESTED IN ADVANCING THE ART OF ANESTHESIA AND CONSERVING THE STATUS OF THE ANESTHETIST, ARE CORDIALLY INVITED TO ATTEND.

ONE OF THE FEATURES OF THIS MEETING WILL BE A JOINT-SESSION OF THE TWO ASSOCIATIONS DURING WHICH A NUMBER OF PAPERS ON ANESTHESIA, AS IT IS OF INTEREST TO THE SURGEON AND INTERNIST, WILL BE PRESENTED.

AS USUAL, THE LADIES IN ATTENDANCE WILL BE DELIGHTFULLY ENTERTAINED.

ANESTHESIA AT THE FRONT

Continuing the Department of Anethesia at the Front, the Editor of the SUPPLEMENT presents additional data collated from authoritative sources that will be of interest to those making a study of Anesthesia in War Surgery.

ANESTHETICS AT A CASUALTY CLEARING STATION.*

GEOFFREY MARSHALL, Captain R. A. M. C., S. R.

Surgical operations performed at a Clearing Station are for the most part urgent. It is often imperative to operate on men within a few hours of their injury while they are still suffering from the effects of shock and hemorrhage. The patients have had to travel some miles from the line by motor ambulance over different roads, and many have been exposed to cold and wet. A correct choice of anesthetic is of the first importance: the patient's life will be as much imperiled by faulty judgment on the part of the anesthetist as by by a wrong decision on the part of the surgeon. There are other cases in which the condition is rendered grave by sepsis, especially gas gangrene; but there remains the majority whose wounds are slight and whose general condition is good.

ANESTHETICS USED.

The methods of anesthesia I have employed are: Ether and chloroform by the open method; ether and chloroform by Shipway's warm vapor apparatus; intravenous ether; spinal anesthesia with stovain; nitrous oxid and oxygen; and local infiltration with novocain.

Let us consider the choice of anesthetic in the various types of cases. We will deal first with the lightly wounded, as they are both the most numerous and the least interesting. Our patients have not been prepared for an anesthetic, so that when brought into the theatre the bowel is full and often the stomach as well. In winter months, difficulty is further increased by the prevalence of bronchitis. A large proportion of the men have cough with expectoration. Autopsies on men who have died of wounds, even when they have had no anesthetic, commonly show the lung tissue to be congested while there is excess of secretion in the tubes. In spite of these failings, the lightly wounded are good subjects for anesthesia. They are for the most

*Read before the Section of Anesthetics of the Royal Society of Medicine, London, 1917.

part young and healthy; they are placid, and have little fear of operation.

The work of the Clearing Station comes in rushes, so that for slight cases the main considerations are *safety, speed and convenience.* The ideal anesthetic is one with which induction is rapid, and recovery complete a few minutes after operation, so that the patient is in fit condition for early evacuation by ambulance train. Apparatus is subjected to much wear and tear, so it should not be complicated or delicate.

Of the anesthetics I have used, gas and oxygen meets these requirements best. Its only drawback are that the apparatus is somewhat cumbersome and the materials costly. Local anesthesia can only be employed in a small number of cases on account of the multiplicity of wounds and their lacerated and soiled condition. Ether remains the most generally used anesthetic. The great majority of slight cases are anesthetized by Shipway's warm vapor method. For induction the mixed vapors of ether and chloroform are used; the process is free from struggling, so that it is seldom necessary for an assistant to stand by the patient. It is rapid: in a hundred cases which were timed induction was invariably complete in five minutes. Anesthesia is maintained with ether alone. There is an absence of secretion, and atropin is not given unless the patient has signs of bronchitis. Consciousness is regained quickly, and vomiting has occurred in only 26 per cent. of all cases, including abdominal cases. Since the warm vapor method was introduced in this Clearing Station last winter, the drop-bottle has passed out of use. Compared with the open method there is a saving of at least 60 per cent. of ether. There is much less diffusion of the anesthetic into the atmosphere of the theatre. This is an important consideration to those working in it at times of sustained pressure.

SPINAL ANESTHESIA.

In choosing an anesthetic for the more seriously wounded, the one overwhelming factor is safety. We require a method which will not be harmful to a patient suffering from the shock of injury, and one which will minimize the shock of operation. It has been urged that spinal anesthesia would meet these requirements and would therefore be of great value in military surgery. For men wounded in the lower extremities I found it a convenient and satisfactory method at a base hospital; cases of profound collapse did not occur. The same good results were obtained at a Clearing Station in all patients who had been wounded not less than forty hours before operation. Of the more recently wounded, however, more than half showed signs of cerebral anemia with great fall of blood-pressure shortly after intrathecal injection of stovain. These signs were pallor, nausea, retching, vomiting, and loss of consciousness. More rarely I have seen extreme restlessness, and in one case convulsions. The radial pulse disappears and the patient presents an alarming picture of collapse which may necessitate interruption of the operation. It has been stated that collapse during spinal anesthesia is not dangerous. I have seen two cases in which it proved fatal, and have heard of a number similar fatalities in recently wounded men.

It is to the man whose wounds are less than forty hours old, and who has lost blood, that spinal anesthesia is dangerous. This is shown by an analysis of fifty consecutive cases of wounds of the lower extremities operated on at a Clearing Station under stovain spinal anesthesia. The drug was used in 5 per cent. solution, in most cases glucose. A dose of 1 to 2 c.c. was given; when smaller doses were used anesthesia was incomplete, or came on so slowly as to make the method impracticable at a Clearing Station. During injection the patient was placed in either the Barker or sitting position, head and shoulders were kept high for the first fifteen minutes, and then horizontal.

Of the recently wounded patients, by no means all collapsed under spinal anesthesia. It is important that one should be able to recognize beforehand which cases will tolerate this procedure. Is there any physical sign which will prove a reliable guide? The appearance of the patient is of little assistance, the pulse-rate and blood-pressure do not help us at all. *A valuable indication is obtained by determining the concentration of the blood.* The method I employ is to estimate the percentage of hemoglobin in the patient's blood by means of a Haldane hemoglobinometer. This method is simple, sufficiently accurate, and only takes a few minutes to complete. A low percentage of hemoglobin—dilute blood—in a man recently wounded, may be taken to mean that he has lost blood. Control observations on healthy unwounded soldiers showed the normal range of hemoglobin to be from 97 to 120 per cent. with an average of about 110 per cent. as against my standard indicator. *In practice I find that if a recently wounded man has a hemoglobin percentage of over 100 it is safe to administer stovain intrathecally. If the reading is below 100 per cent. he will certainly show a serious fall of blood-pressure, and symptoms of collapse.* In these fifty cases the hemoglobin percentage, blood-pressure, and pulse-rate were recorded before the injection of stovain. After injection, blood-pressure and pulse-rate were registered at intervals of about two and a half minutes

for not less than fifty minutes. The blood-pressure was estimated by means of a Riva-Rocci sphygmomanometer with stethoscope over the brachial artery.

We will divide the fifty cases into three classes:—

Class A.—Men operated on within forty hours of receiving their wounds, whose blood was dilute—hemoglobin under 100 per cent.

Class B.—Men operated on within forty hours of receiving their wounds, whose blood was *not* dilute—hemoglobin 100 per cent. or over.

Class C.—All cases in which a greater interval than forty hours had elapsed between wounding and operation, whether the blood was dilute or not.

In Class A—short interval cases with dilute blood—we have twenty-two examples. Of these twenty-two all but three showed symptoms of collapse after injection of stovain. The average fall of blood-pressure was 57 mm. of mercury. In only three cases was the fall of pressure less than 35 mm., the greatest fall was 99 mm.

In Class B—short interval cases in which the blood was not dilute—there are sixteen examples. Of these sixteen, thirteen showed no untoward symptoms whatever after injection. Of the remaining three one complained of nausea, and in the other pallor was the only sign. The average fall of blood-pressure was 17 mm. of mercury, and the greatest fall was 33 mm.

In Class C—men wounded more than forty hours—there are six examples. None showed any symptoms of collapse. The average fall of blood-pressure was 19·7 mm., and the greatest was 35 mm.

If we divide the cases into classes according to the length of time which elapsed between reception of wound and operation, we find that, until we deal with intervals exceeding forty hours, cases with dilute blood suffer a big fall of blood-pressure, while the fall of pressure in cases with blood of normal concentration is less than half as great. When the interval exceeds forty hours the fall of pressure in both types is small and about the same.

I said that neither the blood-pressure nor the pulse-rate indicate whether a recently wounded man is a suitable subject for intrathecal stovain. We have seen that these cases may be divided into two classes according to whether the blood is dilute or not, and that these two classes react very differently to spinal anesthesia. There is, however, little difference in the average initial pulse-rate and blood-pressure of the two types.

As regards the appearance of the patient, some of those in Class A were obviously pale but many were not, although estimation of the hemoglobin showed their blood to be dilute. These patients suffered collapse as profound as those in whom loss of blood was obvious clinically. *The deduction I would draw from these observations is that stovain should not be administered intrathecally to men who have been wounded less than forty hours, unless it has been demonstrated that their blood is of normal concentration.*

Whether other drugs, such as novocain, would be equally dangerous I have no opportunity of determining. We have found the heavy type of solution more satisfactory than that without glucose. The level of anesthesia is more easily controlled when using the heavy solution. As regards fall of blood-pressure, results were about the same with the two solutions. The dose of stovain varied from 0.05 to 0.1 grm., and within these limits fall of blood-pressure was not proportional to dose of drug. Some of the greatest falls of pressure were associated with the smallest doses of stovain, and vice versa. Nor was the fall of blood-pressure proportional to the level of anesthesia.

I will leave it to others to explain why men who have recently lost blood should collapse under spinal anesthesia. Perhaps loss of blood is not the only factor. In secondary hemorrhage there is loss of blood without shock of injury. Do these cases collapse after the injection of stovain? I have no experience.

As regards prevention or combat of the collapse, the most important factor is position of the patient. Fifteen minutes after injection the head should be lowered, and it should be kept low for at least an hour. The practice of propping the patient up on his return to bed is dangerous. One patient in this series, who had no alarming symptoms when in the operating theatre, was propped up on his return to the ward. He became blanched, pulseless and unconscious. He recovered when the head was lowered, the legs raised, and pressure put on the abdomen. Another patient, whose head and shoulders were raised on his return to the ward, died straightway.

Subcutaneous injection of strychnin appears to be without value, both as a preliminary measure to prevent collapse, and subsequently in its treatment. Intramuscular injection of pituitrin proved useless in combating the fall of blood-pressure. Intravenous saline caused temporary improvement in the one case in which it was tried, but the blood-pressure fell again after one and a half hours, and the patient died. This last case was a man with a penetrating wound of the abdomen. Our experience of spinal anesthesia for these cases has been limited and unfortunate. Three men with penetrating wounds

of the abdomen were each given 0.07 grm. of stovain. In each case the injection was followed by a great fall of blood-pressure, and death within a few hours. Lest you should attach undue importance to the personal equation, I should like to say that with spinal anesthesia for appendicectomies our experience has been free from all alarms.

WOUNDS OF THE LIMBS OF EXTREME SEVERITY.

The type of case I refer to is the man suffering from shock. The wounds are recent, and one or more of his limbs are shattered. His face is pale, and the pulse flickering or imperceptible. Another characteristic of the badly wounded man is his low surface-temperature. If put to bed and surrounded with hot bottles his condition usually improves. The blood-pressure is taken every hour, and, if it is rising operation is delayed. This delay must not be too long, or gas gangrene will supervene. The surgeon may be compelled to amputate a limb, and the anesthetist is faced with a pulseless patient who has to undergo a brief but severe operation. The lives of many of these patients may be saved if correct procedure be followed. In the first place morphin should be withheld before operation, or given only in small doses. A recently injured man is particularly susceptible to further shock, and this susceptibility is greatly increased by large doses of morphin. It is my experience that a badly injured patient has a poor chance of rallying if he has received more than ¼ gr. of morphin before operation. *If chloroform be used, the patient is likely to die on the table. With ether the patient's condition actually improves during operation, but he will collapse an hour or two afterwards. If the ether be given intravenously, the patient's condition improves strikingly during administration, but there is profound collapse, which is often fatal, within the next two hours.* The cause of death is not edema of the lungs; in no case have I seen any evidence of this condition either clinically or at autopsy. In several cases there was edema of the liver, and in one patient who died an hour and a half after intravenous ether the gut was edematous from stomach to rectum.

Spinal anesthesia is contraindicated, as I have already shown. *Incomparably good results are obtained with gas and oyxgen, and no other anesthetic should be used for this type of case.* Anesthesia may be so light that the patient will move when nerves are resected. There is practically no evidence of shock from the operation, even when this is an amputation through the upper part of the thigh. A few of these cases has the blood-pressure fallen 15 mm., or the pulse-rate risen more than ten beats per minute. The patient is fully conscious five minutes after operation, and can literally "sit up and take nourishment." There is no collapse during the next few hours, and the subsequent progress is notably good.

There is another class of patient who is gravely ill but who is *not* suffering from shock—I mean the septic case. Early sepsis commonly takes the form of gas gangrene. In a typical case the patient vomits repeatedly, his face is of a pale muddy color, his pulse feeble and running. In spite of this apparently desperate condition, such a patient is a much more favorabl subject for anesthesia than one who is suffering from shock.

Intrathecal stovain, which causes collapse in the recently wounded man, has no effect on this same man some days later, although sepsis may have rendered his general condition much more serious. This same distinction is seen with ether anesthesia, whether the ether be given intravenously or by inhalation. *The collapse which occurs after operation on a man who is suffering from shock or recent hemorrhage, is not seen in these later and septic cases. Some of the most brilliant results have been obtained with intravenous ether; the improvement in the patient's condition, which occurs during administration, is maintained afterwards, and vomiting seldom recurs.*

Gas and oxygen also give excellent results. Chloroform is to be avoided: if this drug be used the man's blood-pressure will fall after operation, and he is likely to die within the next twelve hours.

WOUNDS OF THE HEAD.

There is now general agreement that chloroform is a bad anesthetic for head cases. Operation may be performed under local anesthesia; all tissues of the scalp are infiltrated in a circle widely surrounding the site of incision. We generally use a 0.2 per cent. solution of novocain with adrenalin. No pain is felt even when bone or dura are dealt with. On the other hand, the forcible cutting of bone is disturbing to the patient, so that where mentality is unimpaired general anesthesia is preferable. Warm ether vapor is exceedingly satisfactory. The vapor is given by means of a catheter passed down the more patent of the two nostrils; thus the mask is dispensed with and the surgeon has a clear field. The ether is vaporized by passing oxygen through it. Breathing is easy and noiseless and there is no congestion, whatever the position of the patient's head, so that hemorrhage is not unduly provoked.

WOUNDS OF THE ABDOMEN.

It is in this group of cases that the warm vapor method has shown to the full its striking advantages. The quiet induction, free from struggling, may save much loss of blood from wounded vessels in the peritoneal cavity. The easy breathing

and diminished heat-loss leave the patient in remarkably good condition at the end of a long operation. With regard to heat-loss it is interesting to note that with warm ether vapor I have never seen the so-called ether tremor or shivering fit, which is commonly associated with open ether. The absence of vomiting makes it possible to give fluids by the mouth within two hours of the patient's return to the ward. Men with abdominal wounds are particularly liable to develop bronchitis, perhaps owing to the deficient movement of the lower part of the chest. With open ether 54 per cent. of our abdominal cases had bronchitis after operation. With warm ether vapor the percentage has dropped to 14.7. These figures were obtained from two comparable series occuring in the same months of two successive years; only those cases were counted which survived operation more than forty-eight hours.

During the progress of an ether vapor anesthetic, the blood-pressure shows a tendency to rise. *If the operation involves much manipulation of gut and pulling on peritoneum, the pressure will fall.* This fall, however, will be slow, and the process may be continued for hours without reducing the blood-pressure to a dangerous level.

Exposure of gut outside the abdominal cavity produces a much more serious effect on the patient. If more than 2 or 3 feet of gut are so exposed, after a few minutes the blood-pressure commences to fall rapidly and it continues falling until the gut is returned to the abdomen. This effect is seen when the stomach and omentum are exposed, and even with the great omentum alone. *The covering of exposed viscera with pads soaked with hot saline does not prevent this effect on the patient's condition.* Nevertheless it seems probable that the cause is heat-loss from exposed blood-vessels. Exposure of gut produces much less effect on a man who is not under an anesthetic. I have seen men arrive from the line with several feet of intestine prolapsed through a wound, yet their blood-pressure was within normal limits. In one case more than two-thirds of the small gut had been outside the abdominal cavity for at least four hourse, yet this man's blood-pressure was 142 mm. of mercury and his pulse-rate only 108: the patient recovered. *Surgeons should be urged to make large incisions and work as much as possible with the gut lying inside the peritoneal cavity.*

Apart from copious hemorrhage there is one other procedure which causes rapid fall of blood-pressure during abdominal operations. This is turning the patient on his side. The effect is produced only if the patient has been under the anesthetic for a considerable time before being turned. At the end of an abdominal operation the patient may be in good condition; he is then turned on the right or left side, in order that the surgeon may excise a wound in the back. In a few minutes there is a great fall of blood-pressure and the radial pulse disappears. It may be hours before the patient recovers this lost ground. *The indication is that wounds of the back should be dealt with before laparotomy, as turning the patient has no ill effect during the first half hour of an ether anesthesia.*

For abdominal cases I give oxygen with the ether vapor; no atropin is administered before operation as I have not been able to discover any advantage from giving it. Ether gives better results than chloroform in these cases. With chloroform the blood-pressure falls steadily, and if operation be prolonged the patent may die before the abdomen is closed, or shortly after. *There is one type of abdominal case for which chloroform has advantages—this is the man who has a penetrating wound of the chest as well as of the abdomen.* Here ether cannot be used, as it will, in the majority of cases, provoke fatal intrathoracic hemorrhage. To these patients I now give hyoscin 1-100 gr., atropin 1-100 gr., and morphin 1-6 gr., forty minutes before operation. This is followed by a minimal amount of warm chloroform vapor with oxygen. With this sequence our recovery rate has greatly improved in the chest-abdomen cases, while in the men who died there was no evidence of fresh bleeding into the chest. Still better results are obtained with gas and oxygen, associated with novocain infiltration. (1917.)

With regards to fluids, it has been our practice to give three pints of normal saline subcutaneously during operation. For the collapsed cases this seems to be useless; they do not absorb the fluid. Autopsies on the men who have died as late as thirty hours after operation have shown the bulk of the fluid to be still in the subcutaneous tissues near the site of injection. To these collapsed patients we give saline intravenously, toward the end of operation. *Only a very temporary effect is produced on the blood-pressure if transfusion is completed in the early stages of operation. I find that hypertonic saline raises the blood-pressure, slows the pulse-rate and dilutes the blood for a longer period than does the normal solution.* I hope to give definite records illustrating this point at some later date.

In concluding I wish to acknowledge my debt to my commanding officer and to the medical officers of the Clearing Station to which I am attached. They have given me every assistance in making observation on cases under their care. They have authorized me to say that they are in substantial agreement with the views expressed in this paper. I must add that our views on the choice of anesthetic for the more difficult cases met with at a Clearing Station are subject to a frequent revision. I welcome this opportunity of provoking criticism from those whose experience is so much greater than mine.

(*Continued on page* 68.)

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QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

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F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

APRIL EDITORIALS. 1918

SOME EXPERIMENTAL RESEARCHES AND CLINICAL OBSERVATIONS ON WOUND SHOCK, BLOOD PRESSURE, ANESTHESIA, ACIDOSIS AND FAT EMBOLISM AT THE FRONT.

The Medical Research Committee of Great Britain has just issued an official bulletin on the "Investigation of the Nature and Treatment of Wound Shock and Allied Conditions." This study and that of Goeffrey Marshall on "Anesthetics at a Casualty Clearing Station" (herewith printed in the Supplement), indicate that the scentific spirit is laboring industriously and effectively even under fire. Marshall's researches speak for themselves, although the Editor has taken the liberty of *italicising* his more pregnant conclusions. Some points in the report of John Fraser, F. M. Cowell and W. B. Cannon also deserve editorial emphasis.

Their most interesting researches and observations may be summarized as follows:

Scalp wounds show no appreciable alteration in blood pressure. Cases of compound fracture of the skull with dura intact show a relatively high blood pressure, averaging above 140 mm. Penetrating wounds of the skull with free drainage are generally associated with low blood pressure—from 60 to 112 mm. In perforating wounds the blood pressure would appear to vary according to the anatomic distribution of the wound. In those involving the ventricles, the blood pressure is high, varying from 130 to 170 mm; otherwise the pressure is low. *The blood pressure subsequent to wounds of the head is apt to be unstable. If operation is performed under general anesthesia before the blood pressure has become stable, disaster is liable to ensue. Untoward results can be diminished by delaying operation until the blood pressure has become stable or by performing the operation under local anesthesia, with supplemental scopolamin-morphin amnesia.*

The following deductions have been drawn regarding *abdominal wounds:* In patients with intraperitoneal injury of a hollow viscus, arriving at a casualty the systolic pressures varies from 50 to 100 mm. When the period of primary wound shock has elapsed, six to ten hours, rest, warmth and the sedative action of morphin raises the blood pressure. After ten hours secondary wound shock due to sepsis and loss of blood becomes evident. Perforating wounds of moderate severity affecting solid viscera are associated with relatively high blood pressure; wounds of the liver and kidney exhibiting a systolic reading of from 130 to 140 mm even when hemorrhage has been considerable. Perforating wounds of the viscera which do not open into the peritoneal cavity are associated with practically normal pressure removing large amounts of blood from the peritoneal cavity is accompanied with a very rapid fall of blood pressure.

Large open wounds of the *chest* with free entrance and exit of air are accompanied by a profound fall of blood pressure. Patients with uncomplicated closed wounds, who arrive at the Casualty Station well-cared for show normal pressure. *When severe hemorrhage (internal) has occurred and the patient has been exposed to cold for some hours, or when infection has become established, hypotension is present and progressive.* Reaction from perforation or lasceration of the diaphragm depends on the amount of hemorrhage or incidence of sepsis or entrance of air.

Compound fractures of the lower extremity, especially in the region of the knee and with hemorrhage show a considerable fall in blood pressure. Peculiarly even lower blood pressure is associated with fractures of the arm. In face wounds there is not much alteration of blood pressure unless there is an associated compound fracture of the face bones, when the pressure is generally lowered. *Multiple wounds* of the body and extremities are accompanied by a considerable fall in blood pressure.

With regard to *restorative measures* these ob-

servers conclude that: In cases of profound shock with loss of blood excellent results are obtained from direct blood transfusion. Injection of the calcium hypertonic gum solution (calcium chlorid 0.075 gm., sodium chlorid 1.325 gm., gum acacia 2 gm., water 100 cc. sterilized) will produce an immediate rise of pressure in hemorrhage cases or cases of hypotension complicated by toxemia. This rise may tide the patient through an operation. If the source of infection is removed the tension will remain supported. In milder cases of shock and hemorrhage infusion with modified Ringer solution (sodium chlorid 2 gm., potassium chlorid 0.05 gm., calcium chlorid 0.05 gm., water 100 cc.) is useful. Results obtained with physiologic saline by infusion have been unsatisfactory.

It has also been noted that an uncomplicated wound running a favorable course shows a steadily maintained blood pressure. With the onset of gas gangrene or sepsis there is a sudden fall of pressure. Occasionally a long sustained hypotension may persist, although the patient is quite well and no sepsis exists. *A steadily rising or maintained high pressure reading, even in a severe wound, may be taken as a most favorable prognostic sign.*

Cannon thus summarizes his studies in *acidosis*. Cases of low blood pressure due to shock, hemorrhage or infection with gas bacillus have a diminished supply of available alkali in the blood, that is an acidosis. As a general rule, the lower the pressure the more marked the acidosis. The *pulse* is rapid in these cases, but does not vary with the degree of acidosis. The *respiratory rate* becomes more rapid as the acidosis increases until, shortly before death, a true *air-hunger* may prevail. *Blood sugar* is usually somewhat increased above the normal in shock and hemorrhage. The acidosis in these cases, therefore, is not due to lack of circulating carbohydrate.

Operation on men suffering from shock and acidosis result in serious and rapid sinking of arterial pressure, when it is already low, and in marked and sudden decrease of the alkali reserve of the blood when that reserve likewise is already low. This change may not occur if nitrous oxid-oxygen anesthesia, instead of ether, is employed, but that anesthetic affords no guarantee against the ominous decline. Shocked men, suffering from extreme acidosis with *air-hunger* can be quickly relieved of their distress by intravenous injection of a solution of sodium bicarbonate and their blood pressure restored to normal."

Cannon has has also drawn attention to *fat embolism* following fractures of the larger bone, as a causative factor in primary shock, with resulting *acapnia,* which is best combatted by *carbon dioxid rebreathing.*

Cannon's conception of shock is one of *exemia,*—a term originated by Hippocrates and signifying the draining of blood from essential parts of the circulatory system, especially by capillary concentration.

Cannon thus correllates the factors involved: primary wound shock of a reflex character with a rapid fall of arterial pressure; sweating, exposure, inactivity, delay and lack of fluid forming a vicious circle in promoting an excessive loss of body temperature resulting in accumulative stagnation in the capillaries until a persistent low blood pressure becomes established. The blood thus lost from currency produces a state equivalent to hemorrhage and any true hemorrhage exaggerates the existent exemia. Irrespective of primary wound shock, cold hemorrhage and toxemia will bring about the same sequence of events. As the low blood pressure continues the alkali reserve of the blood is reduced and acidosis begins. Previous starvation and fatigue favor its more rapid development. This state by locally relaxing vessels, which are not under nervous control, by weakening cardiac contraction and increasing the viscosity of the blood, tends to make worse the dangerous condition already established. The individual with acidosis is sensitized and operation and anesthesia, increasing acidosis and further lowering blood pressure, exaggerate the hazard involved in surgical procedures.

Prophylactic measures consist in providing warm alkaline drinks for the wounded at the earliest moment, warm, dry clothes, heating cabinets or devices for combating chill, sweating and exposure. Cautious use of opiates to relieve pain and quiet restlessness; and the intravenous use of hypertonic sodium bicarbonate solution, one pint in about 15 to 20 minutes during the initial stage of the surgical procedure. Then the operation ends, not with an increase of the existent acidosis, but with an alkaline reserve provided. The blood pressure instead of being perilously lowered is actually raised during the critical period. The blood pressure may fall to some extent later, but the improved state of the patient during operations under anesthesia is unmistakable, and the subsequent course of shock cases with the precautions described has been highly gratifying.

American anesthetists, who, for some years past, have been in touch with the researches of Gatch, Mann, Yandell, Henderson, Hogan, Levy and McKesson will find nothing startlingly new in the report of the Medical Research Committee. Its report, however, bears evidence that the profession-at-large is awakening to the fact that surgery and anesthesia involve many intricate problems in physio-pathology that cannot be solved with the knife or inhaler.—McM.

1918—MEETINGS—1918.

The American Association of Anesthetists will hold its Sixth Annual Meeting in Chicago, June 9-10. The scientific sessions will occur on the evenings of the A. M. A. clinic days, so that all surgeons, anesthetists, research-workers and specialists, who are in Chicago at the time of the A. M. A. meeting, may attend without missing any of the sessions of their own sections. A splendid program has been arranged. Owing to the death of Dr. F. W. Nagle, the first Canadian President of the Association, Dr. A. H. Miller will act as presiding officer. In Captain J. T. Gwathmey's absence in service, the Editor of the Supplement will be pleased to furnish any further information regarding membership, sessions and banquet reservations.

The Interstate Association of Anesthetists will meet with the Indiana State Medical Association in Indianapolis, Ind., September 25-27.

ANESTHESIA AT THE FRONT

(*Continued from page* 65.)

NITROUS OXID-OXYGEN WITH REGULATED REBREATHING IN MILITARY SURGERY.*

CAPTAIN H. E. G. BOYLE, R.A.M.C.(T.),
Anesthetist to St. Bartholomew's and the First London General Hospital.

The anesthesia produced by the combination of nitrous oxid and oxygen with rebreathing, and ether, or chloroform and ether when necessary, is one that should appeal to anyone who has the interests and welfare of his patients at heart. The easy induction, the rapid and comfortable recovery are factors that all men who are interested in anesthesia will at once appreciate.

The anesthesia and the technic that I shall attempt to describe is what I have been using at the First London General Hospital. To begin with, the patients are given a preliminary injection of morphin, atropin, and scopolamin about half an hour before the time of operation. I think that half an hour is sufficient to enable one to get the full value of the injection during the anesthesia. Of course, it is not always possible to be sure that half an hour has elapsed before starting the anesthesia, for it is obvious that in a busy morning of 12 to 15 cases it is at times difficult for the sisters to estimate correctly the exact time at which any one case will get to the theatre. I know that I have anesthetised patients who had only just had the injection and patients who had had it an hour or more beforehand. The proportions of the injection that I use are: Morphia tartrate, 1/6 gr.; atropin sulphate, 1/120 gr.; scopolamin, 1/100 gr. This is made up so that 5 minims is the dose.

The apparatus that I use is Gwathmey's, and consists, as you see, of four cylinders, two N_2O and two O. The supply of N_2O and O is controlled by means of two graduated taps, which permit the gases to flow through the glass bottle containing water in a proportion that can be seen, so that one has visual evidence of how much of each gas is being inhaled by the patient. The gases may go direct to the patient via the rebreathing bag, or may be directed through the bottle containing either ether or chloroform and ether, or such mixture as the administrator chooses to place there. The face-piece has at its top a valve to permit a certain amount of intake and output of air and mixed gases, but in actual practice one does not use this valve a great deal except for those patients who will not stand prolonged rebreathing on account of attempts at vomiting during the anesthesia.

* Read before the Medical Society of London, October 29, 1917.

TECHNIC OF ADMINISTRATION.

One of the most important factors in the production of good anesthesia is that during the induction the room should be absolutely quiet. This condition, great as I know the importance of it to be, is well-nigh impossible at a base hospital, as those of us who work there well know, but it can be ensured even there, and in private practice we ought to insist on it.

Position.—Gwathmey lays great stress on the importance of having the patient absolutely flat, without even a small pillow, alleging that he finds that breathing is better. My own experience leads me to think that patients as a rule do not like their heads quite so low, and my usual practice is to have the head slightly raised during the induction, and when anesthesia is complete I gently lower the head to the horizontal.

Dental Prop.—I frequently insert a small dental prop between the teeth before starting the anesthesia. The point to be careful about is to observe whether the patient breathes easily through the nose, and if he does not, or if the nose is a narrow one, with very thin alæ nasi, then I always insert a prop. I have found that patients who have these thin alæ nasi will give trouble unless a prop is inserted. The alæ are drawn in towards the septum and the patient makes violent efforts to breathe, but gets nothing or next to nothing into his lungs. When this happens the patient becomes pale, with a bluish tint around the mouth, the pupils dilate, and sweating comes on. Treatment for this condition is to open the mouth and get air and oxygen into the lungs.

ADMINISTRATION.

The bag is three-parts filled with N_2O and O in the proportion of 4 to 1—that is to say, oxygen is allowed to bubble through one hole and nitrous oxid through four. The face-piece is adjusted to the face and the gas-valve turned on. And here, let me say, that the face-piece must fit accurately. If air is allowed to get in at the sides the even course of the anesthesia will be greatly hampered and there will be a period of excitement and struggling. The valve at the top of the face-piece is kept open for a few breaths and then turned off, so that rebreathing starts almost from the beginning. The supply of nitrous oxid is now increased until it is flowing in freely through all the apertures and even through the tube itself. I do this to lessen the period of induction, for I hold strongly that the period of induction ought always to be as short as possible —seeing that it is the most unpleasant. In a very short time the patient's breathing grows deeper and more regular until eventually in about three to four minutes it takes on that *automatic rhythm* which is such a constant sign of anesthesia.

It is necessary to keep a strict watch on the patient's color, and any degree of cyanosis must at once be remedied by the addition of a little oxygen. It is remarkable how readily these patients respond to oxygen, so much so that only a very little is needed to change the color back to pink. In my early cases I did not realize this fully and gave oxygen until the pink color returned, and in consequence in a few cases I very nearly brought my patient out of the anesthetic state. I now find that it only needs a short, sharp turn of the oxygen valve which opens three or four holes for about two seconds.

As soon as anesthesia has been attained the amount of nitrous oxid coming over is reduced to 4, the oxygen being at 1. With this rate most patients will go on perfectly well and rebreathing can be continued most of the time. If, however, the patient begins to retch or vomit then I think that there is too much rebreathing and one opens the valve on the face-piece and increases the supply of both oxygen and nitrous oxid.

If it is required to deepen the anesthesia the pressure in the bag must be increased until when an expiration takes

place the bag becomes taut. This will deepen the anesthesia in a few seconds, but the patient needs careful watching lest he get blue.

Page prefers to give ether to deepen the anesthesia rather than to push the N_2O under pressure, and on the whole I agree with him.

The signs of overdosage are first of all noisy and stertorous breathing, followed by twitchings of the muscles and accompanied by cyanosis. None of these signs ought to occur in a well-given anesthetic. The remedy, of course, is more oxygen.

The aim of the administrator should be to get an even anesthesia, and this is best obtained by being quite sure that the true state of anesthesia is present before the operator starts, and the keeping the supply of gases at as constant a level as is possible. *Anxious movements of the supply taps only lead to bad anesthesia.* In this, as with other methods of anesthesia, the importance of the open and free airway must never be forgotten.

Mixtures.—It sometimes becomes necessary to add either ether or C.E. mixture to the gas and oxygen in cases where extra relaxation of the muscles is required, or during amputations, when the nerves are being severed. And here, let me say, that I have observed that when large nerves are cut in nearly every case the patient moved unless he was being given ether or C.E. This movement does not appear to do any harm, but is troublesome for the operator. Occasionally, if one is having a little difficulty during the induction in obtaining anesthesia, I find that the addtion of ether for a few seconds is frequently enough to produce the required state, but one must be careful not to keep the ether on for long, as this causes coughing and holding of the breath. Just turn it on and off, the whole movement taking about two seconds, and repeat this at intervals of one to two minutes until anesthesia is complete. I have seldom found it necessary to give ether or mixture continuously for long—three to four minutes being probably as long as it is ever necessary.

I am not at present prepared to make any definite statement as to the relative values of ether or chloroform and ether with this method, and have up to the present only added chloroform when I have come across some especially burly or alcoholic patient who needed something more potent than ether alone. I find on going through my cases that 38 per cent have had ether or chloroform and ether.

Rebreathing.—Those of us who were in the habit of giving prolonged nitrous oxid and oxygen with a Hewitt's apparatus know that it was a wasteful method—wasteful of the gases, but, what is more important still, wasteful of the patient's energies. A long nitrous oxid and oxygen without rebreathing frequently left the patient in a very exhausted state. They often had profuse sweatings, and in a good many instances patients were far from well for some hours afterwards. With regulated rebreathing, however, this is not the case. The patients keep a good color and their temperature is, if anything, slightly raised, and there should be no sweating. The temperature of the expired air as felt when the valve at the top of the facepiece is opened is warm to the hand. I have not thought it of sufficient importance to have this air analysed or to record its temperature.

Overdose.—The treatment for overdose is rapidly to remove the mask and start artificial respiration together with the administration of oxygen, remembering always to keep the airway clear.

POST-OPERATIVE CONDITION.

The post-operative condition of patients who have been anesthetized with nitrous oxid and oxygen with rebreathing and with a little ether when necessary, is to me one of the most striking points of the method. The patients are conscious within two or three minutes of the removal of the anesthetic, and in the majority of cases are not sick. At the First London General Hospital I have had records kept of consecutive cases, and the result is that of 200 consecutive cases 13 were sick once, 4 twice, and 3 had prolonged sickness (i. e., 2 most of the night and 1 for 2 days.)

There is in a fair proportion of cases a feeling of nausea which lasts for about 20 minutes, and occasionally there is some headache, which is probably due to too much rebreathing for the particular patient, but beyond that the recovery is perfect. There is no horrible taste of ether in the mouth, no waves of ether vapor coming over as the patient eliminates the drug. And this holds good, even if a little ether has been given during the early stages of the anesthetic.

One of my most striking cases was an officer who had had the semilunar cartilage removed. The operation lasted about 40 minutes and finished at 5.30 P. M. At 7.30 P. M. he enjoyed a full dinner, a result that I think is unobtainable with the older methods.

Since both of the gases are non-toxic it follows that this combination is especially suited to those cases of which we have all seen such a number—the badly wounded and septic man. These cases do particularly well, and at the First London General Hospital we have records of three cases of amputation at the hip in men who were profoundly septic and who have all done splendidly.

I wish that I were possessed of sufficient power of oratory to paint you a real word-picture of the after-condition of the patients, but, alas, I am unable to do it justice. For a proper appreciation of the condition one should see the operation and the patients afterwards. There is one point, however, that I should like to bring before you as a result of my analysis of 200 consecutive cases at the First London General Hospital. It is that I observe that in most of the cases there is no appreciable rise in temperature after the operation. We are most of us familiar with the rise of temperature as shown on the temperature charts after an operation. This does not appear to be the case after an administration with this combination.

At Queen Alexandra's Hospital for Officers at Highgate, where I have used this method extensively, Mr. H. J. Paterson—who is in charge of the hospital—has observed and commented on the fact that there is no rise in temperature after this anesthetic, and I hope that he will tell us the results so far as the officers under his charge are concerned. The temperature remains steady when clean cases are being dealt with, and even in septic ones I find that the rise is not as great as with other anesthetics.

SUMMARY OF CASES.

Administered by H. E. G. Boyle	550
Administered by J. F. Trewby and residents at First London General Hospital	161
Total	711

Of these, 5 have had bronchitis, and 1 of these 5 has had slight broncho-pneumonia.

Of the 550 cases administered by H. E. G. B., 38 per cent have had either ether or C.E. mixture (2 have had $CHCl_3$ alone).

Fatal cases, nil.

Vomiting	1	During	Once 13
		After	Twice 4
		20	Bad vomiting; 2 most of the night, 1 for 2 days 3

Thus only 15% had what could be termed "bad" vomiting.

Temperature: Highest rise, 101°-105° (drainage of buttock). Average rise, 0.9 of a degree. Three men complained of pain (all of them were bone cases). Two men said that they preferred to come round 2-3 hours after operation. One appendix—$CHCl_3$ added for relaxation, but this was not good. One hemerrhoids—C.E. added, but was difficult to keep quiet. One amputation above ankle required 1 ounce of ether. (This is the largest amount of ether that any of the 200 cases have had.)

Nursing Care.—The work of the nurses is considerably lessened when this combination is employed, for it is obvious that if on the return to the ward the patient is conscious and not vomiting he does not need the undivided attention of a skilled nurse. And this point is of extreme importance in a large military hospital, since it often happens that 8 or 10 operations may be all from the same ward during a morning's work. The contrast between 8-10 semi-conscious and probably vomiting patients and 8-10 men

who are conscious and not sick is one that appeals greatly to an overworked nursing staff.

I have been at some pains to discover the opinion of the sisters and nurses with regard to their patients after this anesthetic, and from inquiries which I have made at the various private hospitals for officers to which I am attached, as well as at St. Bartholomew's and the First London General Hospital, the consensus of opinion is that they much prefer to have their patients given gas and oxygen to anything else.

CONCLUSION.

In conclusion let me say that my reasons for bringing this matter forward are because I am quite convinced that it is an advance on the older methods of anesthesia and, from the patient's point of view, it is infinitely a better form of anesthetic than ether or chloroform, for after this combination the recovery in the great majority of cases is devoid of those unpleasant and distressing conditions with which most of you are familiar.

This paper, then, may be taken as an attempt to procure a more extended use of gas and oxygen with regulated rebreathing in major surgical procedures, and especially in the treatment of our wounded.

My own experience of this method with our wounded men has been confined to work at the First London General Hospital and to various hospitals for officers in London, and I unhesitatingly say that in my opinion the combination of anesthetics which I have attempted to describe is infinitely better for most of the men than ether, chloroform or mixtures thereof. Of conditions at the front I cannot speak with such certainty, as I have, unfortunately, not been there, but it appears to me that it would be of considerable advantage out there if after most of the operations the patients were conscious within a few minutes. It would lessen the work of the orderlies and nurses, and, apart from this aspect of the matter, we must remember that this anesthetic is non-toxic, and therefore there is less strain put on the patient, seeing that he does not have to eliminate the drug, be it ether or chloroform, from his system. Moreover, there is no shock after gas and oxygen.

Finally, let me give one word of warning. This combination of anesthetics is not one to place in the hands of the careless or inexpert—it requires skillful administration and if used carelessly will inevitably lead to disasters.

ANESTHESIA FOR DRESSING PAINFUL WOUNDS

Captain Louis J. Hirschman, U. S. Base Hospital No. 17, American Expeditionary Force, France, after a tour of the various base hospitals and the methods employed, describes an effective method of anesthesia for dressing painful wounds:

"In the dressing of painful wounds a very valuable method of anesthetising the patient is used without danger, even though required daily. The formula of the anesthetic is

Ethyl chlorid	5 cc.
Chloroform	1 cc.
Ether	24 cc.

A piece of flannel cloth is saturated with the entire amount and placed over the patient's face. This is covered with another piece of flannel and this in turn is covered with oil silk containing a small aperture, fitting over the nostrils. This is tied around the patient's face with a bit of tape or rubber tubing. The anesthesia produced will last for 10 minutes and the dressing can be started on the second breath. This anesthesia is apparently devoid of danger, is not accompanied by unpleasant complications, is followed by no deleterious after-effects and is welcomed by the patient. (Journal A.M.A., December 1, 1917.)

Savariaud, although he uses ethyl chlorid alone finds it equally efficacious. Savariaud comments on the difference between the dressings of peace and those required for extensive, ragged shell wounds. When the dressings on these large shell wounds are changed, an anesthetic cannot be dispensed with, and he has found ethyl chlorid best adapted to the purpose for reasons which he enumerates. He protects the patient's eyes with a pad or four or five thicknesses of gauze, and then lays a square of oiled silk over the head, large enough to cover the face and tuck the four corners under the head. A small hole is made in it only large enough to admit the tip of the ethyl chlorid tube. By spraying it gently, progressive and continuous anesthesia is realized, and it can be kept up at the rate of 1 c.c. for each minute of the anesthesia. (Presse Medicale, January 31, 1916).

Boureau highly recommends the substitution of ethyl chlorid for chloroform and ether in war surgery because of its rapid action, because it is much less toxic, having no deleterious effect on the heart, respiratory apparatus, liver, or kidneys, and because of its rapid elimination, all but one twentieth of the amount in the blood passing out within four minutes after its administration, whereas in the case of chloroform one-third and in that of ether one-seventh of the amount still persists in the blood after one hour. In military practice much time is saved through the rapidity of induction of anesthesia and also through the fact that immediately after the operation most of the wounded can leave the ambulance hospital in the sitting position, instead of recumbent. For the initial cleansing of wounds, extraction of missiles, ligation of vessels, and painful dressings, ethyl chlorid is decidedly the agent of choice, and those who have taken it prefer it to ether or chloroform. Boureau's recent experience with it covers nearly 2,000 cases, including 212 missile extractions, 135 removals of bone fragments, fifty-seven amputations or operations on flaps, thirty-six resections, including the knee, shoulder, and elbow, twelve astragalectomies, twelve nerve sutures. Not the least untoward happening attended the anesthesia in any instance, though operations lasting as long as an hour and three quarters were performed under it. All special inhalers were discarded in favor of a four layer compress or rather thick cloth or a mere handkerchief, on which two or three cubic centimeters of kelene were dropped to start with. Although plenty of air was allowed the preanesthetic period never exceeded one minute. After fifteen or twenty seconds the dose of kelene was renewed and the cloth brought tightly to the face, and a minute and a half or two minutes later, complete resolution was obtained, the corneal reflex disappeared, the pupils dilated, and the operation was begun. Anesthesia was then kept up by dropping about one cubic centimeter of kelene on the compress every minute. Slight convulsive movements of the limbs were found to indicate the giving of a little pure air, when they promptly passed off. (Presse Medicale, May 21, 1917).

ANESTHESIA AND ANESTHETICS IN WAR SURGERY.

Dr. Bilhaut, surgeon of the Hôpital International de Paris, has addressed a communication to the Société de pathologie comparée on the subject of general and local anesthesia in war surgery. He accords the preference to chloroform. He finds chloroform easier to administer than ether and less likely than ether to cause a chilling of the respiratory tract, such as may produce pneumonia or pulmonary congestions. In 812 important operations performed by Bilhaut there were no unhappy results from the use of chloroform. The reaction on the liver has been found negligible. In case an operation may require some time, the surgeon should have recourse to general anesthesia. During the course of an operation it is deplorable to have to substitute narcosis for local anesthesia. Therefore, from the very outset, the surgeon should make a definite choice, and in case of doubt he should decide in favor of general anesthesia. In skeletal lesions, which are so frequent, general anesthesia is indispensable. Long bone resections and the removal of bone splinters should be undertaken with scrupulous care, even down to the minutest details, in order to preserve the periosteum, as the significant experiments of Professor Ollier have proved. Without general anesthesia, one cannot bring to a satisfactory conclusion this extremely delicate work, which is indispensable in order to secure anything like complete restorations. It is only by proceeding thus that Bilhaut has obtained in his war surgery the complete reparation, without shortening (real or apparent), of extensive losses

of substance in the long bones. Local anesthesia (cocain, stovain, novocain, freezing) should be confined strictly to minor operations of short duration.

Dr. Fiessinger has called attention to the fact that the results obtained by Bilhaut seem to prove that the operations performed on soldiers under war conditions give better results than in times of peace. It seems as if the new conditions created by the war have brought about an increase in the potency of organic defense. Under ordinary conditions it seems that ether might possibly be superior as an anesthetic to chloroform, since it does not cause alterations of the hepatic cells; however, it would appear from the communication of Bilhaut that, under the existing conditions, chloroform has lost part of its injurious properties.

Society Proceedings

Membership in a society devoted to your specialty is an essential to success.

AMERICAN ASSOCIATION OF ANESTHETISTS SIXTH ANNUAL MEETING.

The Sixth Annual Meeting of the American Association of Anesthetists will be held in Chicago, June 9-10, the scientific sessions being held on the evenings of the A. M. A. clinic days. It is anticipated that this innovation will enable all interested surgeons, research-workers and anesthetists to attend the meeting without missing any of the clinics or scientific sessions of their A. M. A. sections.

Owing to the untimely death of Dr. F. W. Nagle, the late president of the Association, Dr. A. H. Miller will preside.

The following are some of the papers of interest that will be presented:

President's Address, A. H. Miller, M.D., Providence, R. I.; Experiences of an Anesthetist at the Front, Major W. B. Howell, C.A.M.C., Montreal, Canada; Some Observations on the Teaching of the Pharmacology of Anesthetics, Torald Sollman, M.D., Cleveland, O.; Combined Anesthesia for Cesarean Section, J. Clarence Webster, M.D., Chicago, Ills.; The Prophylactic Use of Pituitrin for Hemorrhage in Nose and Throat Operations under General and Local Anesthesia, Samuel Salinger, M.D., Chicago, Ills.: Blood Pressure as a Guide During Major Operations, Harold G. Giddings, M. D., Boston, Mass.; Nitrous Oxid-Oxygen Analgesia in Normal Labor and Operative Obstetrics, W. C. Danforth, M. D., Evanston, Ills.; Gas-Oxygen Analgesia for Short Anesthesia in Daily Practice, Will Walter, M.D., Evanston, Ills.; Deaths During Operations in Relation to the Surgeon, the Anesthetist and the Hazardous Risk, E. M. Sanders, M. D., Nashville, Tenn.; Accidents from Local Anesthetics—a Preliminary Report, Robert A. Hatcher, M.D., New York City, N. Y.; Recent Studies in Postoperative Pneumonitis, A. O. Whipple, M. D., New York City, and the Operative Risk in Cardiac Disease, F. A. Willins, M. D., Mayo Clinic, Rochester, Minn.

The following are the candidates for officers for 1919: W. B. Howell, M.D., Montreal, Canada, President; Joseph E. Lumbard, M.D., New York City, Myra E. Babcock, M.D., Detroit, Mich., and Ray A. Rice, M. D., Columbus, O., Vice-Presidents; James T. Gwathmey, M.D., New York City, Secretary-Treasurer; Harrington Marr, M.D., Nashville, Tenn., and John W. Seybold, M.D., Denver, Col., Members of the Executive Committee.

In the absence of Capt. J. T. Gwathmey in service abroad, the Editor of the Supplement will be pleased to furnish any further information about membership, banquet reservations, and place of meeting.

F. H. MCMECHAM, M.D.,
Sec'y-Pro-Tem.

Avon Lake, Ohio.

IN MEMORIAM.

F. W. NAGLE, M.D.,
Montreal, Canada.
President of the American Association of Anesthetists.

The American Association of Anesthetists has suffered a great loss in the untimely death of its first Canadian President, Dr. F. W. Nagle, of Montreal, who was to have presided at the forthcoming Chicago meeting.

Dr. F. W. Nagle was asphyxiated by motor fumes early on the morning of January 25 while working at his motor car outside his garage in the rear of his home. The car stuck in the snow, and it is thought Dr. Nagle got under it to dig away the obstruction when he was overcome by the fumes from the exhaust. He had an appointment at the Royal Victoria Hospital, of which he was staff anesthetist, and was hurriedly making ready to go there in his car when he met his death.

The body was found under the car by a nurse in the employ of the family, who had gone out to report receiving a telephone call. It was thought at first Dr. Nagle had fainted, and a hurry call was sent for Dr. Joseph Kauffman, one of his closest friends, who realized at once what had happened, but, hoping there was a chance of saving Dr. Nagle's life, sent in an emergency call for an ambulance. Meanwhile Dr. Kauffman tried to restore Dr. Nagle's life by means of artificial respiration, and similar efforts by a number of physicians at the Royal Victoria Hospital proved unavailing.

It is not known exactly how long Dr. Nagle had been working at his car before he was overcome, but the engine had stopped for lack of fuel before the discovery was made by the nurse. Dr. Nagle had evidently been getting ready to adjust his tire chains.

Dr. Nagle was 38 years of age. He was born at Ferguson Falls, Ont., and was educated at Almonte, Ont., and at Ottawa College. He studied medicine at McGill University, graduating in 1908 with honors. During his college course he made a special study of anesthetics, and on graduation was appointed anesthetist to the Royal Victoria Hospital, a position he held up to the time of his death. Dr. Nagle traveled widely for study and research work in his specialty, was the author of many outstanding articles, and became recognized as a prominent authority on anesthetics.

He was also anesthetist to the Montreal Maternity Hospital.

He was elected President of the American Association in 1917.

He is survived by his widow, formerly Miss Georgie Ewing, five children, his father and mother, Mr. and Mrs. F. W. Nagle; one brother, James Nagle, and a sister, Miss Ella Nagle. Another brother, Sergeant Gregory Nagle, was killed in action in France last year.

Dr. Nagle was buried at Almonte, Ontario.

It is a pity that this sterling anesthetist should not have been spared to act as the first Canadian President of the American Association of Anesthetists, to emphasize the amalgamation of professional interests that is taking place between the two countries. His confreres, who had learned to admire and love him, can only join in extending their heartfelt sympathies to his dear ones in their bereavement and tragic loss.

REPORTING ACCIDENTS FROM LOCAL ANESTHETISTS.

EDITOR ANESTHESIA SUPPLEMENT:

The Committee on Therapeutic Research of the Council on Pharmacy and Chemistry of the American Medical Association has undertaken a study of the accidents following the clinical use of local anesthetics, especially those following ordinary therapeutic doses. It is hoped that this study may lead to a better understanding of the cause of

such accidents, and consequently to methods of avoiding them, or, at least, of treating them successfully when they occur.

It is becoming apparent that several of the local anesthetics, if not all of those in general use, are prone to cause death or symptoms of severe poisoning in a small percentage of those cases in which the dose used has been hitherto considered quite safe.

The infrequent occurrence of these accidents and their production by relatively small doses point to a peculiar hypersensitiveness on the part of those in whom the accidents occur. The data necessary for a study of these accidents are at present wholly insufficient, especially since the symptoms described in most of the cases are quite different from those commonly observed in animals even after the administration of toxic, but not fatal, doses.

Such accidents are seldom reported in detail in the medical literature, partly because physicians and dentists fear that they may be held to blame should they report them, partly, perhaps, because they have failed to appreciate the importance of the matter from the standpoint of the protection of the public.

It is evident that a broader view should prevail and that physicians should be informed regarding the condition under which such accidents occur in order that they may be avoided. It is also evident that the best protection against such unjust accusations and the best means of preventing such accidents consist in the publication of careful, detailed records when they have occurred, with the attending circumstances. These should be reported in the medical or dental journals when possible, but when for any reason this seems undesirable a confidential report may be filed with Dr. R. A. Hatcher, 414 East Twenty-sixth street, New York City, who has been appointed by the committee to collect this information.

If desired, such reports will be considered strictly confidential so far as the name of the patient and that of the medical attendant are concerned, and such information will be used solely as a means of studying the problem of toxicity of this class of agents unless permission is given to use the name.

All available facts, both public and private, should be included in these reports, but the following data are especially to be desired in those cases in which more detailed reports cannot be made:

The age, sex and general history of the patient should be given in as great detail as possible. The state of the nervous system appears to be of especial importance. The dosage employed should be stated as accurately as possible; also the concentration of the solution employed, the site of the injection (whether intramuscular, perineal or strictly subcutaneous), and whether applied to the mouth, nose or other part of the body. The possibility of an injection having been made into a small vein during intramuscular injection or into the gums should be considered. In such cases the action begins almost at once—that is, within a few seconds.

The previous condition of the heart and respiration should be reported if posible; and, of course, the effects of the drug on the heart and respiration, as well as the duration of the symptoms, should be recorded. If antidotes are employed, their nature and dosage should be stated, together with the character and time of appearance of the effects induced by the antidotes. It is important to state whether antidotes were administered orally or by subcutaneous, intramuscular or intravenous injection, and the concentration in which antidotes were used.

While such detailed information, together with any other available data, are desirable, it is not to be understood that the inability to supply such details should prevent the publication of reports of poisoning, however meager the data, so long as accuracy is observed.

The committee urges on all anesthetists, surgeons, physicians and dentists the making of such reports as a public duty; it asks that they read this appeal with especial attention to the character of observation desired.

TORALD SOLLMAN, *Chairman,*
R. A. HATCHER, *Special Reference,*

Therapeutic Research Committee of the Council on Pharmacy and Chemistry of the American Medical Association.

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July, 1918

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BEHIND THE LINES OF VERDUN*

ALONZO MILTON NODINE, D.D.S.

Oral Surgeon and Dental Consultant, French Hospital, New York; Assistant Dental Radiologist New York Throat, Nose and Lung Hospital. Late Oral and Dental Surgeon The Hôpital Française de New York No. 32 bis, Passy par Veron (Yonne) France. Oral and Dental Surgeon New York Nose and Throat Hospital.

NEW YORK CITY, N. Y.

Step up to the ticket office, buy your passage, walk up the gang plank, and you are off to France. Nothing like it! If you think you "just want to run over to Paris, and then motor out to the front line trenches," well—you'll just not go; that's all there is to it. You'll stay right in Cohoes. The belligerents are not engaged in this terrible conflict to furnish a spectacle for the idly curious, but for certain ideals and ideas which they hold dearer than life.

If you want to go to France during the war, you must select your father and mother with great care. You must pick out a father and mother who were born either in the United States or in one of the allied countries. You may argue and protest and implore that it wasn't your fault, that you couldn't help it—but the French look at it in a different way, and they are in the majority at the other end of the line. In other language, you might get your passport, and you might possibly (hardly probably) get your passport viséd by the French consul in New York, but when you landed in France you would be sent back!

To secure a passport a request is made for application blanks to Washington or to the passport office in New York. Four application blanks are needed with five photographs—one for your passport and one for each application with a letter stating for what and where you are going. You must make application for your passport at least seven days before you sail—giving the name of the steamer, day of sailing, and the port to and from which it sails. If the requirements in the passport are met to the satisfaction of the Department of State, you will receive your passport at the passport office in New York. You must have either a copy of your birth certificate or two persons who will swear that you were born when and where you declared you were, and they must also swear that you have made no false statements in any part of your passport.

NEEDED AT THE HOSPITAL FOR VERDUN.

About a year ago I planned to give my services as Oral and Dental Surgeon to a large hospital just outside of Paris. They were not accepted at that time, but at a later period the opportunity was presented to go to this hospital, or to the Hôpital No. 32 bis., which is located fifty miles from Verdun and is the depot for Verdun to which the wounded are brought by sanitary trains from the dressing station immediately back of the lines. I chose Hôpital No. 32 bis. An oral and dental surgeon surgeon was needed; in fact the hospital would not have been so long without one had the head surgeons appreciated the need and the benefits to be derived from such service. Cases were sent from this to to other centres because there was no oral surgeon here to assist the general surgeons in the repair of the maxillary and facial cases. The need for this service was felt by some of the surgeons and nurses, and repeatedly brought to the attention of those in charge. The need was apparent to me and the benefit that would result from the organization of an oral and dental surgical service appeared so great that I offered my services and to pay my traveling expenses to and from the hospital. My services were accepted on this condition, but later the hospital decided to pay my expenses.

At the request of the president of the French Hospital, Mr. Jouvaud, I bought a very good dental equipment. It consisted of a hydraulic chair, electric all cord engine, bracket table and such supplies and materials as would be needed for immediate use. In addition to these were my oral surgical instruments, dental instruments, one hundred and twenty-five yards of gauze (folded into small gauze wipes of a convenient size) novocain (sufficient to make about 3,000 c. c. of solution) orthoform, sutures, etc.

The two or three weeks prior to my sailing were crowded with work of a professional and private character and that incident to the organization of this department. The equipment and supplies were gone over several times to make certain that no necessary or essential thing had been forgotten.

ON THE STEAMER

On Saturday, June 24th, one hour before sailing, I removed the stitches from a recent operation. My patient showed no resentment and very kindly motored me to the steamer.

On the pier I was introduced to Mr. Emile Rey, administrator of the hospital in Paris, and to my companions of many months, Dr. Alexander Bruno, of Roosevelt Hospital, and a Rumanian artillery officer, the two latter shared my stateroom. I carried letters of introduction to a number of celebrated surgeons in France.

* Read during the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917. Reprinted by courtesy of *The Dental Digest.*

Ambulances ready to go for wounded.

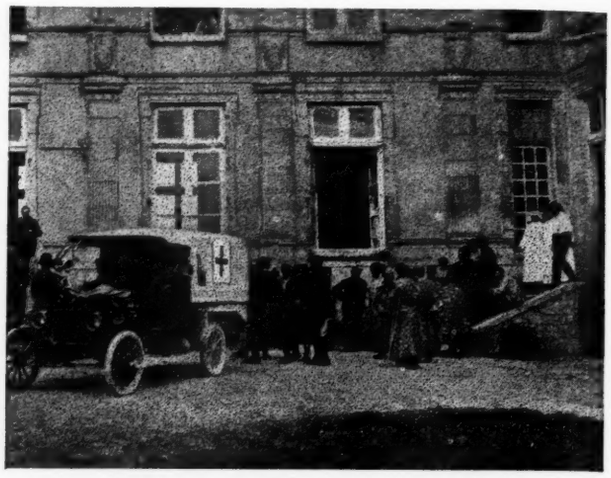
Arrival of wounded from the front ready to be taken to the hospital.

HOSPITAL STAFF (READ LEFT TO RIGHT)

1. Dr. John Irwin, Assistant Medical Chief; 2, Miss Demming, New York Hospital; 3, Mr. Rey, Administrator of Hospital; 4, Dr. T. M. Savage, French Hospital, N. Y.; 5, The writer; 6, Dr. Eugene H. Pool, Medical Chief, Attending Surgeon, New York Hospital; 7, Mr. Chapel, Administrator of Hospital; 8, Sister Elénore; 9, Dr. Bruno, Roosevelt Hospital, New York.

French soldiers mobilized to put the hospital in condition to receive wounded.

Hôpital No. 32 bis. Formerly the Château.



Arrival of wounded from the train.

About three o'clock the steamer *Lafayette's* lines were cast off and we were on our way to France. One day on shipboard followed another with delightful weather, beautiful skies and fine nights. No submarine or other hostile craft was met. Two interesting features of the voyage were the life boat and life belt drill in which all took part. They had an added interest because of the fact that any moment we might need the knowledge. Each passenger was assigned to a certain boat on a certain deck in order to familiarize all with their proper station should any accident occur. We tried on life belts so that we should know how to get into them if necessary.

About two days from Bordeaux, the "76" was uncovered. A target in representation of a submarine periscope was dropped astern and several shots were aimed at it.

The morning of the night that we arrived at Bordeaux we were met by one or two French torpedo boats. These accompanied us to the river's mouth. The sail up the river was most charming and interesting. The beauty of the scenery was enlivened by the picturesqueness of the red-tiled houses and the tall graceful poplar trees. Along the river bank or farther back on farms we could see German prisoners working. We could also see French battleships that had been in the Dardanelles undergoing repairs.

About eight o'clock at night we docked at Bordeaux. In the dining salon of the steamer passport examiners assembled, ten or twelve in number. We were admitted one by one. Each person and each passport was closely scrutinized and examined by the whole number as they sat on either side of a large oblong table. Finally we were through and our baggage was examined by the customs.

EN ROUTE TO PARIS

At eight o'clock in the morning we left for Paris on the train. The journey through southern France was very interesting. From the car windows we could see old and beautiful chateaux, vineyards and farms, which gave evidence of the wealth and thrift of the French people. We arrived in Paris about 7 o'clock at night. In a taxi we passed the Madeleine, where, of mornings, flower women gather to sell wonderful bunches of beautiful violets and flowers of all kinds, then down the Boulevard de la Madeleine to the Place de la Concorde, where stand the two statues of Alsace and Lorraine, which prior to the war were draped in black, but now were draped in wreaths of flowers. In the distance we could see the Eiffel Tower and on our right hand was the beginning of the Champs Elysées, then down the Rue de Rivoli, the famous street of delightful arcades, buildings and shops, with the gardens of the Tuilleries on one side and, then to the Hotel Continental. We were assigned to beautiful rooms with bath rooms which were marvels of completeness.

About ten o'clock we went out to see Paris at night. Down past the Place Vendôme where the Palace of Justice is a neighbor of the Ritz Hotel. Here a few military motor cars were waiting for some late decisions of officers. We then walked down to the Boulevard Capucines. The lights were shaded, a few people were on the streets, taxis seemed plentiful. Every café we entered we were met with: "It is too late, we must close at ten thirty."

Strange it seemed indeed for the Paris of gaiety and life to be dark and quiet. In the daytime on the streets of Paris one would see three men out of five in uniform, and four women out of five in mourning. British officers, Australians, Canadians, South Africans, Russians and Belgians were seen almost as frequently as the officers of France. There seemed no depression, or sadness, except the

sadness which so great a number of people in black would bring. Here and there about the city one could see a business with a sign of mobilization on the door, but there were not so many as one would naturally anticipate.

Friday night we received our uniforms and Saturday morning we left for Passy. We secured the military rates because of our uniform and arrived at Sens about 9:45. In the train we noticed the preponderance of military uniform over civilians. Before the approaches to every railroad bridge were sentries, also at all railway stations.

Dr. McLaren, one of the surgeons at the hospital, met us with a car. As we motored through this medieval town of Sens it seemed very strange and delightful. Shops, houses, streets, riverside, everything was quaint and odd. This is the depot that supplies Verdun. In the town we noticed the passing and repassing of troops to and from the front. On the outskirts of the town, we were halted by a sentry but were given permission to pass when we told who we were.

The countryside from Sens to Passy is a beautiful farming district, the roads are straight, hard and smooth and bordered with graceful poplar trees. We passed through two or three French villages which suggested paintings I had seen. The countryside differs from the American countryside by reason of the fact that we saw no tumbled down buildings, few or no fences, no litter, no cans, newspapers, or wood strewn about the farmhouses or along the roadside; everything seemed to be picked up and clean.

About one mile away we could see the Chateau, which is surrounded by a high flint wall. We entered the grounds through a big gate and then across the drawbridge and through the drawbridge gate into the quadrangle of buildings, which, in times past, were coach houses, stables, farmhouses, cattle stalls and retainers' quarters. The car stopped in front of the Chateau and we were at the Hospital, or as it is known to the French, Hôpital No. 32 biz., "the finest organization," Major Ford, U. S. A., wrote he "had seen in France."

The property consists of eighty acres of beautiful park land and is entirely surrounded by a high flint wall. This wall is pierced at four or five places with gates. Some years prior to the war it was bought by the French Government; later used by refugees from invaded districts.

Before the declaration of war there was practically no such thing as a dental service for the French army. The medical service of the army was neither well organized nor well prepared. What organization the French army had was pitiably inadequate to take care of the great number wounded in the opening battles of the war. This was conspicuously so in regard to first aid and the means to transport the wounded to the dressing stations and base hospitals.

But the French military authorities had ready a plan, drawn up in detail, for the complete organization of such a service. This plan was put into operation as soon as possible and now the Service de Sante is a model of efficiency.

An American surgeon working in a French military hospital but a short time said to me: "There are many things the French do, which to me, at first, seemed to be done for no logical reason—but the longer I'm here the more firmly I become convinced that the French know exactly what they are doing, and are doing it well."

The claims of dentists, based on incontestable testimony, for the institution of an organized dental service for the Army were rejected by the military authorities before the war. They denied not only the usefulness of such a service, but declared that dentists could be only an annoyance and an incumbrance.

When the French mobilized, the dentists were mobilized not into the medical or a dental service but into the various branches of the French army with absolutely no provision for the utilization of their services in a professional way.

The dentists and the dental students were withdrawn from hospitals and clinics and there was practically no dental service for even the civil population.

But soon such men as Godon, Roy, Vian, Martinier, d'Argent, Villain and Bioux, in Paris, Pont in Lyon, and Cavalie in Bordeaux organized and instituted, with the help of many other dentists and other organizations, a dental service for the wounded, for those who had been rejected because of the inadequacy of their dental organs and for those already in the military service. Now there are forty centres in the chief cities of France for the treatment, repair and restoration of dental, maxillary and facial defects and wounds. There is a corps of military dentists and a corps of naval dental surgeons.

IS THE DENTAL SERVICE NEEDED?

Dr. G. Villain, general secretary of the Dental College of Paris, from a personal observation at his own depot, estimated that there were about two full army corps disqualified because of the condition of their teeth. If the teeth of the men are so bad before they enter the army, this condition is mag-

nified to a great extent after they have been in the army behind Verdun for some time. And after they have been wounded their condition is still worse.

It was stated that there were forty centres in the chief cities of France for the treatment, restoration and repair of dental, maxillary and facial defects and wounds. There are also mobilized dental surgeons at the various depots throughout France. There is also one dental automobile attached to each Army Corps. These are cabinet laboratories perfectly equipped and capable of following the troops wherever required.

There are about eight thousand hospitals of one kind or another throughout France. How many of these have dental and oral surgeons in their service I do not know, but the percentage is very small. There are not enough dentists in France to properly attend to the civil population. The needs of the army can only be partly met—and the demands of the hospitals are met at all only in isolated cases. What is the condition of the teeth of the wounded when they arrive at the hospitals? From my observation of the men when they arrive from Verdun, practically all need dental attention of some kind. Nineteen men out of twenty need fillings. All need their teeth scaled and cleaned. Fifty per cent. have abscesses of one kind or another, and about twenty per cent. need plates, to replace lost teeth.

RIGGS' DISEASE NOT PREVALENT

The number of men who have Riggs' disease is very small and those who do have it to any marked degree are men who come from the large cities. The peasants are comparatively free from it. This, I believe, to be largely due to coarse food and the simple life the peasants lead. The institution of an oral and dental surgical service in a hospital accomplishes many things. Under good conditions it may improve the facial appearance of men who have borne the stress and strain of war—those men who have been shattered and battered. Anything that will improve their appearance may be a gift of new hope. They may return to their families and their friends with added confidence and a certain pride that their teeth are at least presentable. How much this means to them only those who have served in these hospitals may tell. They will allow you to do almost anything to their teeth if you assure them that those you remove or those that have been lost will be replaced.

Men who need all the nutrition they can get to assist in building up their resistance, to assist them in overcoming the drain of the terrible wounds, all of which are infected; to help restore nerves shattered by the terrible artillery fire and by the carnage of an attack, such men need a good masticating apparatus. They cannot chew properly with missing teeth, with decayed teeth, and they cannot chew properly with sore and aching teeth.

It is realized by hospital surgeons that an efficient masticating apparatus is a most important factor in the recovery of the wounded.

ABSCESSED TEETH A SOURCE OF POISON

Again, in another way, these diseased and abscessed teeth are a source of poison. Hidden abscesses on dead teeth furnish micro-organisms and toxines that neutralize the constructive forces of the body. They delay, postpone and overcome efforts of the system to combat the infections that have invaded the body, and retard the healing processes.

The constant ingestion of food mixed with pus and the discharges of diseased teeth and gums affect the digestion and add another and an internal source of infection for the system to overcome.

The pain and distress of these aching teeth plus that of the constant agony of terribly lacerated wounds, of infected and shattered limbs and joints, produce such a strain that even iron constitutions weaken under their influence.

Consider for a moment the annoyance, the discomfort and irritation that one diseased tooth may cause in an individual otherwise perfectly healthy. Multiply this several times, then add to it the agony of a body shattered by shell fire, shrapnel fire, rifle fire, liquid fire, asphyxiating gas, bayonet wounds and grenades. Add this to nerves that have been shattered by thunderous and constant roar of heavy calibre guns, the piercing shrieks of light artillery, the vicious grind of machine guns, the horrible boom of trench mortars and the uncanny cries of aërial torpedoes. How man can survive all this is truly wonderful.

Relieve, reduce or take away any pain, any discomfort, and irritation and the rest may be borne with greater ease and greater fortitude. And nothing will contribute so much to this relief as the removal of or stopping of the pain of aching and diseased teeth, no personal sacrifice is too great to contribute to alleviation of this vast amount of suffering.

Some men may be placed in such physical condition that they will be enabled to return to their regiments. Many man are now unable to return on account of the condition of their teeth. Other men may be placed in such condition that they may return to their life-work or be re-educated to a work for which their shattered bodies may be most easily trained.

In the reconstruction of jaws and faces the oral and dental surgeon plays an important part co-operating with the general surgeon. He it is who makes possible the work of the surgeons in these cases.

For the dental profession, it seems to me and it is apparent to all, that the description of an organized purpose is valuable not only at times of war but in times of peace.

The experience and lesson of the European countries now at war should be, maybe, an opportunity for us to organize our disorganized purpose, to bring order out of the chaotic condition in which our efforts are now. This is quite as valuable as the experience to be gained from the execution of our professional efforts. It would be extraordinary if there should not come out of the union of thought and purposes, to accomplish the most good in our special field, certain standardization of operation, treatment and equipment, that would prove most useful in our civil practice.

The first patient was Pasquereau, a private, wounded at Verdun. He had a compound fracture of the humerus and radius, and wounds in the chest. The compound fracture was badly infected. It suppurated continuously due to infected foreign material carried into the depth of the wound. There were several large rubber tube drains inserted into his arm. The pathological process had stimulated the bone producing cells so that the elbow joint was about twice the size of normal and was completely ankylosed.

An examination of his mouth disclosed a large suppurating abscess in the region of the upper first right molar with broken down teeth on either side. In the lower jaw the three molars were beyond repair. An X-ray examination showed the upper first molar, upper second molar and first and second bicuspids infected.

The following day under novocain the three lower molars were extracted, the sockets curetted of any granulomas and the process smoothed with bone-cutting forceps and packed with iodoform gauze. This was changed every day. Owing to his poor physical condition and the extreme pain of his wounds most of the dressings were changed while he was in bed. At a later date his upper molars and bicuspids were removed and his teeth scaled and polished. His physical condition improved so rapidly after this that he was able to be sent south to a convalescent hospital.

My second patient was Oswald Holtz, son of General Holtz, wounded in the battle of Champagne. The terrible severity of this attack shattered the nerves of many who took part, his included. He was wounded in both legs, right ankle and feet. These wounds would almost completely heal, then they would open up until several small spicules of bone worked out.

An examination of his mouth showed a large abscess extending from the first bicuspid to the second molar. It was as large as an egg and bulged down half of the roof of his palate. This was lanced. A large amount of pus was discharged and the wound packed with iodoform gauze.

The next day under conductive anesthesia the upper molar was removed. The palatal root was broken and in using an elevator the tip of the root was pushed into the maxillary sinus. The following day under ether the opening into the maxillary sinus was enlarged with a large gauze and then irrigated with normal saline solution. The maxillary sinus was packed with one-inch iodoform gauze. The upper first bicuspid was removed and lower second bicuspid and first molar were removed.

This patient's nerves were so shattered that only by the aid of an anesthetic, such as ethyl chlorid, could the dressings be changed.

The maxillary sinus was irrigated every other day, the opening painted with iodine and packed. The opening gradually closed without any suppuration.

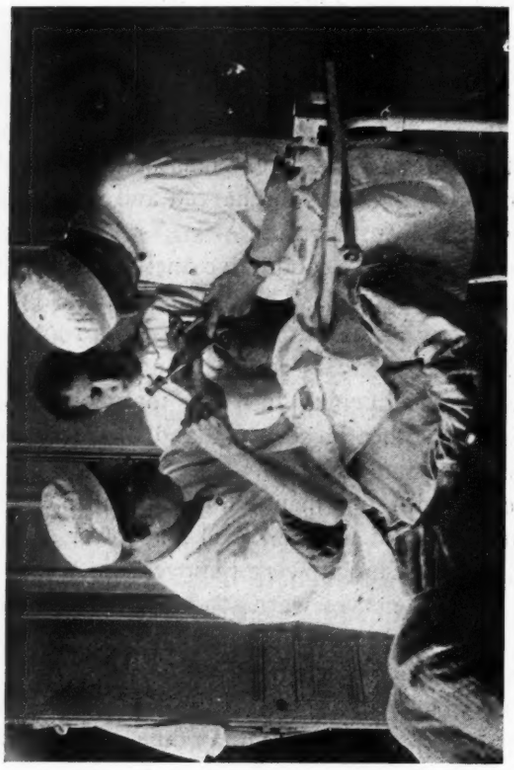
Le Blanc, wounded at Verdun, had penetrated wound of the face passing from a point about three-quarters of an inch in front of the maxillary sinus; then under the floor of the orbit into the great wing of the sphenoid.

This produced a paralysis of the sensory nerves of the right eye and ankylosis of the temporo-maxillary articulation.

An examination of his mouth revealed the upper first bicuspid and upper left canine and first bicuspid abscessed. These were extracted under novocain, the sockets curetted, the process clipped with bone-cutting forceps and then packed with iodoform gauze.

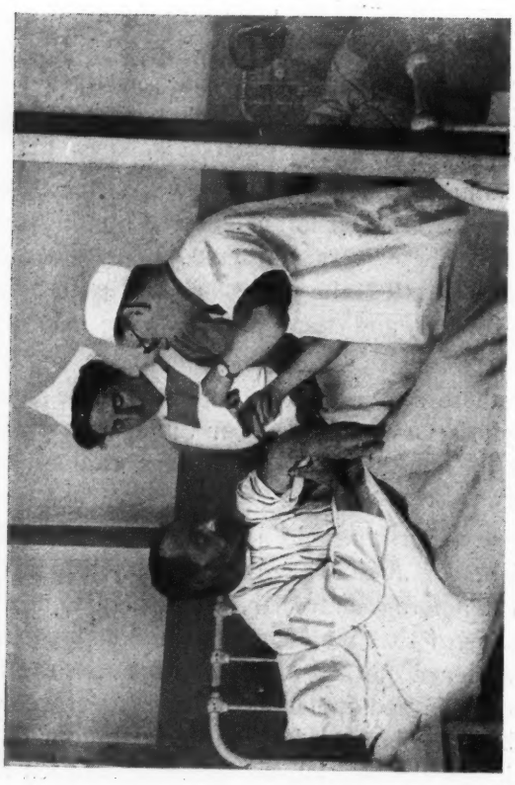
After these had healed the first step in reducing the ankylosis was made. Rubber tubing was placed between the upper and lower incisors, canines and bicuspids.

In twenty-four hours the jaws were opened about three-eights of an inch, with considerable pain at the left temporo-mandibular, the articulation and the muscles of that region. Modelling composition which hardened quickly was placed between the incisors, canines and molars to relieve the soreness caused by the rubber tubing. In three or four days the modelling composition was inserted between the front teeth and base plate gutta percha with cement



Dr. Savage and the author resecting a root.

Staff of Dr. Blake's Hospital



The writer irrigating elbow wound of St. Paul.

The writer packing sockets of teeth after extraction and curettement.

was packed tightly between the upper and lower molars.

Later there was enough space between the molars to insert rubber tubing. This process was continued until, when I left the hospital he could open his mouth about three-quarters of an inch and could masticate his food with some degree of comfort. The fact that the left side was not ankylosed interfered with the opening of the right side, because no matter how much space was obtained on the right hand side and left hand side would open up still more and relieve the pressure on the right hand side.

Had the suppuration in this deep wound stopped, I would have preferred an operation to close the large hole under his orbit. But any attempt to have performed such an operation would have confined the infection with almost certain production of a meningitis.

Duquesne was wounded at Verdun. He had a compound fracture of the lower right leg just above the ankle. The cellular tissue of the lower leg was badly infected with considerable swelling of the thigh.

When I was called to see him in the reception ward he was in bed. He had been given morphin for several nights for pain from a large alveolar abscess on the upper right side in the region of the first molar and bicuspid. The whole right side seemed involved. The infection extended up to the eye and nose and to the third molar. He was the color of lead. Under ethyl chlorid this abscess was lanced with a discharge of a considerable amount of pus. The wound was packed with iodoform gauze.

Six days later while still in bed, under novocain, the three broken molars and two bicuspids on the right side were removed, the sockets thoroughly curetted, the alveolus trimmed and the wound packed with orthoform and iodoform gauze.

Several days later the lower right broken down molars and second bicuspid, the upper left first and second bicuspids and the lower left first molar were extracted. The sockets of these were curetted, the alveolus trimmed and the wounds packed with iodoform and orthoform gauze.

After these wounds had healed there still remained some teeth to be filled, scaled and polished. He was carried upstairs on a stretcher. These teeth were filled and his teeth were scaled and polished.

Impressions of his upper and lower jaws were taken, and partial plates made. These were inserted a short time before he was transferred to a convalescent hospital in the south of France. The physical condition of this patient improved remarkably after the removal of the infected teeth, and a curettement of the sockets.

Peep, the pet of the hospital, wounded at Verdun in left loin below the twelfth rib, and in the right loin the bullet affected the spinal cord so that he was paralyzed below the waist. While in bed we gave him a mandibular injection to remove the lower left first and second molars. This necessitated considerable bone cutting with chisels and the roots were removed with elevators. Owing to the difficulty of working on the patient in bed, it took about an hour to remove the roots, the sockets were curetted and trimmed with bone-cutting forceps and then packed with iodoform gauze. This was one of the most difficult cases of extraction which I had while in the hospital.

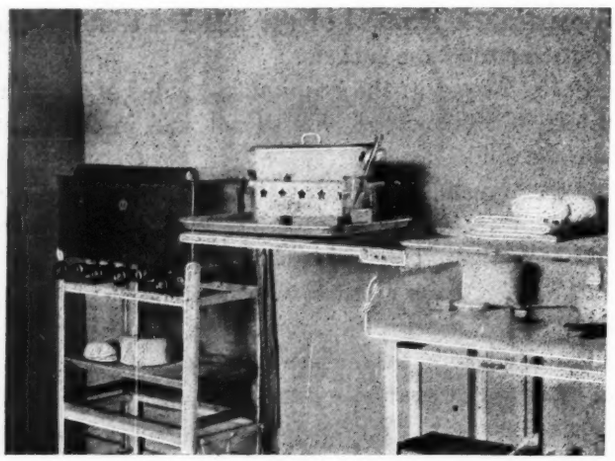
Cherri was wounded in the head at Verdun, while in charge of the captive balloon. He was sent to the hospital from Sens for X-ray examination and examination of his mouth and teeth. The X-ray revealed badly broken down second bicuspid, first and second molars on the upper left side. A tuberosity and infraorbital injection were made and these teeth extracted. In curetting the sockets of these teeth an opening was discovered into the maxillary sinus in the region of the first molar. This opening was enlarged and the maxillary sinus curetted. A large amount of broken down and disorganized material was removed. The sinus was thoroughly irrigated, and painted with iodine. This was packed with over twenty-four inches of one-inch iodoform gauze. This was changed every other day until he left the hospital.

Marchand Emile, a fine big fellow, was wounded at Verdun, August 22, 1916, and reached the hospital September 10th. He had an enormous lacerated wound of the right forearm. This wound extended almost the full distance of the arm from the elbow to the shoulder. He also had a fracture of the ulna with some paralysis of the hand and fingers. An examination of his mouth showed a great many teeth in the upper and lower jaws on both sides broken down and decayed. An X-ray examination revealed large areas of destruction around the apices of several teeth. These areas were as large as ten-cent pieces.

An infraorbital injection of novocain was given him on the right side and also infiltration. The first molar, first bicuspid, the lateral and central were extracted and the sockets of the molar and the centrals were curetted and packed. A mandibular injection was given on the right side. The first, second and third lower molars, and first and second bicuspids were extracted. The septisms between

Staff of Dr. Blake's Hospital

The writer packing sockets of teeth after extraction and curettement.



Sterilizing and novocain outfit

these teeth were destroyed, and granulomas as large as cranberries were curetted out. The alveolar process was curetted and smoothed with bone-cutting forceps and the overhanging gum trimmed away with curved scissors. These large wounds were then flushed out with normal saline solution, painted with iodine and packed with iodoform gauze impregnated with orthoform. The packing was changed every other day until the wounds healed. Later the upper left bicuspid and third molar were removed after giving an infraorbital injection, and the lower first molar was removed under a mandibular injection. The upper third molar was abscessed. The socket was curetted and packed.

When these wounds had healed, which takes place rapidly when the process has been clipped away and smoothed with bone-cutting forceps, impressions were taken and upper and lower partial plates were made. The impressions were sent up to Paris by parcel post to a mechanical dentist and were returned in about a week.

Dorleac was wounded at Verdun in September, 1916; the exact nature of the wounds has escaped me. He complained of a toothache in the upper first molar on the right hand side. In excavating this cavity the pulp was exposed; this necessitated its devitalization. Arsenic was sealed in the cavity for two days. The rubber dam was applied and the pump removed and the canals enlarged with phenol sulphuric acid and sodium of potassium. Wires were placed in the canals and the tooth radiographed. The radiograph showed the wires passing through the apex of the three roots. The root canals were then filled, first using Calahan's rosin and chloroform solution followed by chloropercha and gutta-percha points. The radiograph showed three canals filled perfectly. This was the only molar the roots of which I attempted to fill, and I would not have attempted it in this case had I not accidentally exposed the pulp. After the root canals were filled the cavity was lined with copper cement and an amalgam filling inserted.

As a general practice, in a military hospital, it is not advisable to attempt to fill the roots of pulpless molars. The time consumed is too great. It is better practice to remove all such teeth. But the anterior teeth whose root canals may be filled and if an infected area is disclosed by the radiograph the root ends may be resected.

Santoecha—nicknamed Smiles by the nurses—was wounded at Verdun. I have no record of the nature of his wounds. An examination of his mouth showed an excellent set of teeth in a sound condition except the right central, which had been devitalized by a fall or a blow. A radiagraph of this tooth revealed an area of destruction at the apex. With the rubber dam in place the contents of this root and showed the cavity in the bone destroyed by with phenol sulphonic acid, sodium and potassium. The canal was then filled using the technic previously outlined and the tooth cavity filled with synthetic cement. Having decided to resect the root, infiltration anesthesia was used on this tooth, with a tampon of novocain in the right nostril. A crescent-shaped incision was made about 3-8 of an inch above the gum margin over this tooth, with the bow of crescent downwards. A periosteal elevator raised the periosteum from the bone and pushed back the flap. A four-pronged retractor was inserted under the flap and held up out of the way by Dr. Savage,

French nurse preparing novocain solution.

the surgeon who assisted me. With gouges the outer plate of bone was removed from around the region of the root end about the size of the end of a large lead pencil. This uncovered the end of the root and showed the cavity in the bone destroyed by the pathological process. With two sharp blows of the hammer on a straight chisel the root end was resected. The resected end was easily removed and the cavity curetted out. The root end was then smoothed by a surgical bur. The cavity was then flushed out with normal saline solution, then painted with iodine. The flap was brought down and the wound closed with three silk stitches. The stitches were removed in five days and the wound healed. The entire operation took three-quarters of an hour.

Verney Louis, private, was wounded at Verdun, June 16, 1916. He had a seton of the thigh. He was also wounded in the abdomen and had three large wounds in the lower part of the right leg. An examination of his mouth revealed a broken down upper first molar and a broken down second lower molar and first bicuspid. Under infiltration injection for the upper first molar, and a mandibular injection for the lower second molar and bicuspid these teeth were extracted and the sockets curetted of their pathological tissues and packed. A radiograph of the upper right cuspid showed an area of destruction. The canal of this tooth was sterilized and filled. One morning Monsieur Germain Babtist of the French foreign office visited the hospital. As the general surgeons had no operations that morning, Dr. Eugene Pool, the medecin chef, suggested that I resect the root to show the work of my department. With the assistance of Dr. Savage the root was resected in about fifteen minutes. As he had never seen such an operation before he was much interested and pleased. He commented on it in his lecture in Sens the same evening. In this case the wound was packed with iodoform gauze and the dressing changed every other day. It healed in about eighteen days. A synthetic filling was placed in the tooth cavity. Later an impression was taken and he was supplied with an upper partial plate.

Leo Geoffrey, a tall, well-built peasant, was wounded at Verdun, June 30th. He had several small wounds about the middle of the right leg and an oblique fracture of the tibia. An examination of his mouth on September 25th disclosed the remains of a broken down and infected second molar on the lower right hand side and an infected upper right first molar. These were extracted under conductive anesthesia with elevators. After curretting the socket of the lower second molar and smoothing the rough alveolus, the curette at the bottom and distal part of the socket slid over something quite hard and smooth. The socket was syringed out and the enamel of the third molar was seen. The socket was painted with iodine and packed with iodoform gauze. An X-ray plate and film were taken of the tooth in the afternoon and disclosed a large impacted molar in the angle of the jaw. The following day under novocain conductive anesthesia, the tooth was removed. A triangular piece of bone was removed with the chisel from the distal and buccal side of the molar and the molar tilted out with elevators. This took about an hour and a half to accomplish. The alveolus was smoothed with a curette and bone-cutting forceps and the socket packed with orthoform and iodoform gauze. This was changed every two or three days until he left the hospital.

The impression seems to prevail that work in a base hospital is one ceaseless effort. This idea is a mistake. The organization of the hospital service for the French wounded is the following.

As previously indicated Hôpital Française de New York received its wounded from Verdun. The region in which the hospital is located is known as the Fifth Region. In this region are a number of hospitals scattered through small towns and villages with a total capacity of 16,000 beds.

Every week, sometimes twice a week, our hospital was inspected. The patients were examined and a list made of those patients who were in such condition of convalescence, that in the event of a serious engagement, they could be sent to hospitals farther south, to make room for the anticipated wounded. The list was usually made out by the médecin chef of the hospital and later changed or added to by the inspector of the region. This list was made up of two classes of wounded, *assis,* or those that could walk, and *couches,* those who must be carried on stretchers.

When a serious engagement is planned or expected, an order is sent out to the hospitals in the region in which the engagement is to take place, to evacuate a specified number of blessés. This number usually coincides with that of the list made out by the inspector of the region. The Chef of the Service de Santé in this region, then knows that when the engagement does take place there will be ready for immediate reception of wounded—let us say, for example, in this fifth region, ten thousand beds. When the work of distributing the wounded takes place either by sanitary trains or ambulances each hospital is notified by telephone to prepare to

receive and to take care of a certain number of wounded.

If after a hospital has been evacuated of a certain number of wounded and the expected engagement is either postponed or does not take place—then the hospital is left with but a few wounded and little work for the staff to do. Such a condition may last for weeks—then without any hint or warning the telephone bell will ring and we will be instructed to meet the sanitary train with our ambulances for the reception of let us say, as actually occurred, sixty blessés, at eight P. M.

In our hospital after the receipt of such a message this médecin chef orders large chaldrons of water to be heated. With this the wounded on their arrival at the hospital are washed and bathed. Then stretchers are placed in the ambulances. Beds prepared in the reception ward and everything made ready for the reception of the blessés. The ambulances then start for the railroad station and line up in a convenient place.

The stretchers are gotten out stacked on the station platform to exchange for those upon which the blessés are carried from the train. Awaiting the arrival of the sanitary train is a time of anticipation and speculation as to the nature of the wounds to be dealt with. When the train comes into the station and stops, it does so without a jar or a jerk—as smoothly as one's hand slips into one's pocket.

The wounded are most carefully removed from the train and placed in a row on the platform. The stretchers are exchanged and the médicin chef of the hospital gives the médicin chef of the train a receipt for the number of wounded received. Then the train moves on to another station where the remaining wounded are distributed to other hospitals.

In the pale moonlight these sixty wounded lay on the station platform, swathed in bandages. With a lump in my throat I gave a cigarette to each man who wanted one. It did not seem to matter how badly they were wounded, the cigarette was welcome. There were a few women in this little town who never failed to bring hot coffee and milk for the wounded, no matter what time of day or night they arrived.

Each man was tagged with his descriptive tag, which gave name, regiment, date he was wounded, the nature of his wounds and whether or not he had received antitetanic serum.

The blessés were then placed in the ambulances, four in each Ford and driven carefully to the hospital. Here their uniforms were taken off and later sterilized. Their valuables were placed in a small white bag with their name attached and taken in charge by the military secretary.

They were then washed with soap and hot water, clean pajamas put on and then put to bed. This was all accomplished in about two hours after their arrival.

No operations were performed that night. The work assigned to me the following morning was that of removing dressings of about forty wounded. Many of these wounds were terrible compound fractures. All wounds were infected and suppurating. Some of the feet and hands, arms and legs had the appearance of an internal explosion. After the removal of the dressings the surgeons and nurses followed.

Dr. Joseph Blake (to right), Dr. Roche (to left).

Sketches were made of the wounds and their condition noted. If an immediate operation was indicated that also was made part of the history. If a case required *x*-ray or a fluroscopic examination, that, too, was stated. Then fresh dressings were applied as soon as possible. Almost all fracture cases needed new splints with suspension and tension and some with continuous irrigation. To each surgeon was assigned an equal number of cases and his name placed on the charts.

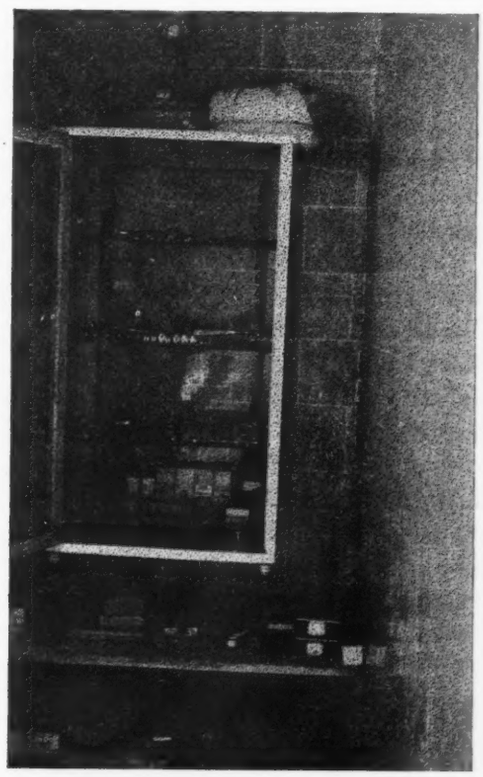
In making "the rounds" with the médicin chef we came across a blessé, St. Paul, upon whose chart no surgeon's name appeared. He had been overlooked because he happened to be in a bed away off in a corner. He had a head wound and an elbow wound. The médicin chef asked me if I thought I could look after him and if so to put my name on his chart. My name went on the chart

Then I removed the starch bandages from his head and found two shrapnel wounds above and behind his ear. The pieces of shrapnel had been removed but the wounds continued to discharge. These wounds were dressed each day with gauze and the healing process stimulated with nitrate of silver. The elbow wound had two drains. This wound was irrigated with boric acid solution and dressed with wet boric acid dressings every day. After two weeks the elbow wound showed no marked tendency to heal but the discharge had lessened in amount. There seemed to be a collection of fluid in the joint

Shell wound of face.

which the drains did not reach. Under ether I made an incision into the pocket of fluid and inserted a drain deep enough to allow the fluid to escape. In about three weeks the head wounds had healed and the fourth week the arm showed considerable improvement so that only small rubber tissue drains were required.

Maurice Delcourt, from the captured city of Lille, was wounded at Verdun. He had a badly fractured tibia with the loss of considerable bone substance. He had had a gas bacillus infection in his fractured leg which nearly cost him his life. A bone graft was inserted in his tibia to supply the lost bone substance. After he had recovered from this operation he asked me to reduce his lip. In boxing with the French champion's brother Carpentier, his upper lip had been smashed. This produced a lip on the left hand size about twice the size of a normal lip. Under novocaine I dissected out a V-shaped section of the vermilion border including the scar tissue. Three sutures brought the edges of the wound together. When the sutures were removed and the wound healed the lip had not been reduced enough. Another and deeper section of the lip was then dissected out and the wound sutured with two horsehair sutures. These were removed in five days leaving a normal lip. It was painted with iodine for several days to reduce the slight swelling produced by the operation and sutures.



Dental and anesthetic equipment

In addition to the routine oral and dental surgery I had the opportunity to assist in the major operations, sometimes giving the anesthetic.

I also assisted the surgeons in applying plaster of Paris splints. These consisted of plaster of Paris bandages applied over thin strips of wood. These kept the limbs in a firm and immobile position.

The mouth and teeth of my patients were kept in a clean and sanitary condition by the use of a solution made of vinegar one part, alcohol one part and water one-eighth part. This was used on a tooth brush if they had one, if not they used gauze with which to mop and wipe their teeth and gums.

Some of the most interesting experiences I had while in France were the visits to several French and American hospitals.

One day we motored to the Dr. Joseph Blake hos-

pital at Ries Oranges. I had a letter of introduction to him. With the other surgeons we had dinner at the hospital. Later we saw Doctor Blake remove a piece of shrapnel from the vicinity of a man's heart.

On another occasion we visited the Mechano-Therapy hospital at Fontainebleau. The hospital occupies part of one of the wings of the famous Chateau de Fontainebleau.

In the hospital are a great number of ingenious devices for the re-education of limbs whose functions have been impaired. There were also all kinds of baths and electro-therapeutic appliances for treating nerve cases and contracted limbs.

The Chateau is the famous and beautiful Fortes of Fontainebleau. Before the battle of Marne the German Army penetrated France to within fourteen miles of Fontainebleau. At that time many of the most valuable treasures of the Chateau were removed to places of safety farther south. When we visited it all of them had not been returned.

On another occasion we visited some French Red Cross Hospitals at Melun. This gave us the opportunity to notice the difference between the American hospitals and the French hospitals. In these hospitals the French Red Cross nurses had practically no training or experience prior to the war. In some of them there was no resident surgical staff. The surgeons had their headquarters in one of the other hospitals and visited these hospitals for dressings and operations. In some of the hospitals the Red Cross nurses were only on duty in the daytime.

We had the opportunity to see Doctor Roche perform a nerve suturing operation and were shown the cases upon which this operation had been performed.

In some cases there was a partial return of function of the nerves and in others the results were negative.

In the three or four hospitals of this town there were no Dental Surgeons.

On another occasion we visited the Val de Grasse Hospital in Paris. This is the great military hospital in which the military surgeons are trained. With its annexes it has about 5,000 beds.

Doctor Morestin operates in this hospital in addition to five other hospitals in Paris. Doctor Morestin is the great plastic surgeon and his work is considered by Doctor Pool to be the standing surgical feat of the war. We had the opoprtunity of seeing hundreds of cases of face, nose and jaw wounds in all stages of treatment and repair. We saw cases that had just arrived and cases that had been completed. We spent the entire morning with Doctor Morestin and returned in the afternoon to see him operate. One of the cases he operated on was for the removal of an aneurysm of the common carotid artery.

8 WEST 40TH STREET

ANESTHESIA IN WAR SURGERY *

HENRI VIGNES, M.D.
FRANCE

During a recent offensive I had charge of handling 471 wounded soldiers, brought direct from the battle field after the lapse of from one and a half to four hours. All were submitted to whatever intervention was necessary to permit their evacuation to the rear. This series included 34 wounded with partial or complete fractures. Others of the blessés required removal of debris, cleansing, drainage and hemostasis, some excision of contused and torn tissue and many extractions of projectiles. Two hundred and two projectiles were searched for and 178 extracted. All but one of the projections *not extracted* were in the hand or lungs.

General anesthesia with ethyl chlorid, ether and chloroform, alone or in sequence, with or without morphin, was used, as was also local anesthesia with cocain, stovain, novocain, neocain with adrenalin and preliminary morphin, and also quinine-urea hydrochlorid. General anesthesia was used in 55 cases; local in 198 and 185 injections of morphin were given, usually 0.01 gm., rarely 0.02 gm., ten minutes before operation, and frequently in the neighborhood of the wound. Few of the cases were suitable for regional anesthesia.

We always allowed a lapse of eighth minutes for the anesthetic to take effect before operating and with quinine-urea this period was lengthened to 20 minutes. Team work in the operating-room enabled us to alternate operations and dressings while the wounded were being anesthetized. Spinal anesthesia was not used.

Ethyl chlorid was used alone for briéf anesthesia or in sequence with ether or chloroform. It was sprayed on a compass of gauze closely adapted to the contour of the face. Preliminary morphinization secured a profound and prolonged anesthesia. While there were no untoward complications with general anesthesia cases, in which cocain analgesia proved unsatisfactory, and general anesthesia was substituted, were inclined to show a stage of excitement. In one instance under chloroform anesthesia, while searching for a projectile, a general convulsion followed each time the instrument touched an exposed nerve.

The results with local anesthesia were mostly entirely satisfactory to the patients and operator; and were only so considered when no signs of pain or discomfort were manifested during operation or complained of afterward.

* Read before the Société de Pathologie Comparée, Paris, France. Editorial abstract for American surgeons and anesthetists.

Under local anesthesia, especially with the addition of adrenalin or pituitrin, there was little or no alteration of the pulse-rate during or immediately after operation, the maximum difference being about 30 beats, the minimum 2; and the changes were not incidental to any failure of the analgesia. Pituitrin showed a more stabilizing effect on the circulation than adrenalin.

INDICATIONS FOR GENERAL ANESTHESIA.

Except for simple, painless dressings, any other surgical procedure on the wounded in this war, absolutely demands either the use of general or local anesthesia. With Pierre Moiroud I have already emphasized this point. The cleansing, the removal of debris from and the draining of the wound with counter-openings are all operations demanding minute care. It is the present practice to excise all the contused tissues. One cannot do that properly and thoroughly without the aid of anesthesia or analgesia.

Paradoxical as it may seem, anesthesia is the best prophylaxis against shock.

It is the pain of operation added to that of the trauma that is the principal cause of shock. This is in keeping with the researches of Crile. Evidently general anesthesia administered to a shocked patient is an aggravating factor, but the risk is less than that involved in operations without anesthesia. It is most important to conserve the stability of the circulation from nervous shock. There is no sense in being insouciant about inflicting pain under the belief that it is harmless.

INDICATIONS FOR MORPHIN

Interest attaches to the use of morphin in conjunction with both general and local anesthesia. As a preliminary to general anesthesia, morphin decreases the likelihood of excitement during induction and surgical narcosis is more readily secured, while a smalled dosage suffices for maintaining anesthesia. Morphin acts as a prophylactic measure against the incidence of acapnia. It also diminishes postoperative complications. For all these reasons the preliminary injection of morphin, with or without the addition of such circulatory stabilizers as ether, pituitrin, and adrenalin, is an excellent means of diminishing the dangers of intoxication and shock.

R. Picque has well said: *"Anesthesia must be the object of the solicitude of the surgeon. . . . When one has admired the resources in action and the resignation to suffering of those, whom history continues to call the poilus, one cannot tolerate for an instant the thought of their suffering further through a negligence of anesthesia."*

The results obtained from the preliminary injection of morphin in local anesthesia have always appealed to me.

INDICATIONS FOR LOCAL ANESTHESIA

Many and varied surgical procedures can be satisfactorily handled under local anesthesia. I have had no difficulty in excising contused tissues and removing debris; in cleansing the site of fractures, especially those of the tibia, and in removing projectiles deeply imbedded in the thigh, loin and regions of the scapula.

Team work in the operating room must be relied on for sorting out the patients that can be best handled under local or general anesthesia. Substituting general anesthesia, after beginning with local, leaves a disagreeable impression on the patient, means loss of time and opens the way to unnecessary infections. It is important then to determine the contra-indications for local anesthesia, both in connection with the site of operation and the lesions that are anticipated.

Vascular regions which bleed freely and others in which dissections are difficult are unsuitable for local anesthesia. When important organs are involved, when tendons and aponeuroses cross the operative field, when it is difficult to see the lesions, or when a retractor is necessary, general anesthesia is indicated.

On the leg the crural space and the popliteal region are least favorable for local anesthesia because they contain important structures and necessitate tedious and delicate dissection. Except for the bulge of the calf the lower leg is unfavorable for local anesthesia on account of the arteries and varicose veins that are encountered, while the instep is crossed with tendons.

The bend of the elbow, the lower arm, the wrist and palm of the hand are regions unsuitable for local anesthesia. The palm of the hand, in particular, is very sensitive. I have repented, on several occasions, searching for even superficially imbedded projectiles in the palm, under local anesthesia.

Deep wounds of the neck must be operated on under general anesthesia.

On the contrary, exploratory incisions of the scalp should be done under local anesthesia. DeMartel advises the employment of novocain-adrenalin for all intracranial surgery of war wounds.

Great discretion must be used in selective anesthesia, as the real conditions of the wounds cannot be anticipated and are often more extended than suspected and require considerable intervention. The violence of the projectiles, the destructive shattering of bones and the hernias of different layers of the

musculature cannot be definitely forecast previous to operation. In case of doubt it is better to use general than local anesthesia.

When the symptoms indicate extensive internal destruction of tissues and not merely a perforating tract, general anesthesia is indicated. While local anesthesia may suffice for the anticipated procedure, it not infrequently happens that it is insufficient for accomplishing what is finally necessary for a complete surgical toilette, or what M. Gaudier calls, a complete excision of the wounded area. Such removal diminishes the risks of complications from infection and provides scars which do not interfere with anatomical function.

Injuries of large blood vessels with hematoma, requiring turning out of the clot and ligation, cannot be handled under local anesthesia. If *x*-ray and the localization of the pain indicate more damage to the soft part than the bone, these cases may be done under local, but in the presence of periosteal involvement, when extended interference is demanded, general anesthesia must be used.

INDICATIONS FOR DIFFERENT LOCAL ANESTHETICS

Cocain, novocain and stovain have given us excellent results, but if it is anticipated that general anesthesia must supplement the local, it is better to use stovain or novocain to avoid the cocain excitation during the induction of anesthesia.

For prolonged and extended operations it is advisable to use quinine-urea hydrochlorid on account of its control of after-pain. It should be recalled, however, that quinine-urea diffuses very slightly through the tissues and the injection must be very accurately made.

INDICATIONS FOR DIFFERENT GENERAL ANESTHETICS.

Ethyl chlorid should be used whenever possible. A preliminary injection of morphin provides a prolonged operative period. Ethyl chlorid anesthesia presents the great advantage that the wounded operated on shortly awaken to complete consciousness and in consequence can be more readily evacuated to the rear.

The respective indications for chloroform and ether are the same as for civil practice. However, it is important to administer ether in such a way that its volatilization will not be interfered with by the low temperature in which it must occasionally be given in the surgery of war.

CONCLUSIONS.

It is very important to have specialists in anesthesia at the front.

Anesthesia must not be made an easy berth for the physician who is sent by chance to a military, surgical ambulance. Each surgeon should have his own anesthetist, who should be an expert in his specialty and should be conversant with the most recent advances.

If it is necessary to use members of the ambulance corps to give anesthetics, when a physician is not available, these should have had thorough training in the administration of general anesthetics, especially etherization with an Ombredanne inhaler —a method which minimizes the risks involved.

Familiarity with the stock apparatus provided enhances the results of general anesthesia and if the Ombradanne and Ricard apparatus are both at hand, better work will be done.

Warmed vapors, as used by certain American and English anesthetists, induce anesthesia more rapidly and pleasantly, and produce less irritation of the respiratory tract, less nausea, shock and fewer postoperative pulmonary complications. This method deserves study and use, as do other technics, which are at present little known among the profession in France.

SOME OBSERVATINS ON LOCAL ANESTHESIA FOR CERTAIN OPERATIVE PROCEDURES; AND ITS EFFECTS ON BLOOD PRESSURE.*

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Local Anesthesia has its limitations the same as any other method of anesthesia. It cannot be successfully employed for every operation nor can it be used on all patients. In some instances it is not suited to the temperament of the patient; in others, the operation is one that should not be attempted by local alone. The variety of major operations that is possible to be completed by local, depends upon a proper selection of cases and the experience of the operator; his patience, his gentleness in handing tissues, and special training in the method. Bodine, Mitchell and Allen perform a majority of their surgical operations under local—the greater number of their patients come to them because they use local anesthesia.

ESSENTIALS FOR SUCCESS WITH LOCAL ANESTHESIA.

The first requisite for the successful use of the local method is an accurate knowledge of the nerve supply and the ability of the operator to block off completely every sensation of pain. When the nerve supply cannot be entirely controlled, general anesthesia should be employed.

* Read during the Joint Session of the Interstate Association of Anesthetists and the Mississippi Valley Medical Association, Toledo, O., October 9-11, 1917.

The sensation of pain is confined to the skin, nerve trunks, parietal peritoneum and synovial membrane of the joints. Lennander has demonstrated that all internal organs obtaining their nerve supply from the sympathetic and vagus, below the branching of the recurrent nerve, have no sensation. For this reason the abdominal and pelvic viscera are insensitive to heat, cold, pain and pressure, both in health and disease. There is no sensation of pain in bone substance, bone marrow, cartilage, tendon, articular surface of bone covered with cartilage, brain, lung, liver, heart, kidney, kidney pelvis, ureter, bladder serosa and intestines.

A slight twinge of pain is felt when blood-vessels are cut. Traction on the ligaments of the thoracic, abdominal or pelvic viscera will cause pain; traction on the mesentery, besides producing pain, will cause epigastric discomfort and nausea. I have frequently noted the pain of ligating the meso-appendix when it has not been previously blocked with local anesthesia.

SOLUTIONS, SYRINGE AND NEEDLES.

Novocain one-fourth per cent. solution, or cocain one-tenth per cent. solution, is strong enough for any operation. Adrenalin (1:10,000) five minims to the ounce of anesthetic solution is usually employed to give prolonged anesthesia. The solution should always be freshly prepared for each operation, and of a definite strength, so that the operator may at any time know the exact amount of anesthetic that has been used. The drug must be sterile and dissolved in sterile normal salt solution. Cocain and novocain can be sterilized by heating to 212° F.; a temperature above this, as well as repeated sterilizations, are injurious.

Different operators prefer various syringes. I have found an all metal syringe holding ten c. c. very serviceable. The syringe should take a slip needle to facilitate rapid refilling.

DECOMPRESSION.

Local Anesthesia. Dr. L. F. Watson
Fracture of Skull. Mr. C.—Aged 20.
No morphin.

Hour.	Pulse Rate.	Blood Pressure.	Remarks.
5:30	42	82	Struck over left Parietal Bone, 1 p. m.
:35	38	82	Deep Coma 2 hours.
:40	42	84	Nerve block of scalp.
:45	40	85	Blocking subcutaneous tissues.
:50	45	92	Scalp incised.
:55	45	95	Periosteum retracted; T fracture.
6:00	46	118	Skull trephined.
:05	42	118	Flap cut with DeVilbiss ronguers.
:15	52	118	Bone flap removed.
:20	60	118	Dura lacerated; large blood clot.
:25	60	118	Hemorrhage from brain.
:30	60	115	Piece of muscle into site of hemorrhage
35	58	118	Hemorrhage checked.
:40	60	118	Closing scalp.
6:45	60	118	Patient rational and conscious.

It is apparent from this chart that local anesthesia in decompression operations has several advantages over general narcosis.

APPENDECTOMY.

Combined Anesthesia. Dr. L. F. Watson.
Acute Appendicitis. Miss H.—Aged 18.
No morphin.

Hour.	Pulse Rate.	Blood Pressure.	Remarks.
11:08	135	122	Before operation.
:05	125	130	Skin and subcutaneous tissues blocked.
:10	125	122	Skin and subcutaneous tissues incised.
:15	120	118	Aponeurosis and muscles blocked.
:22	120	118	Incision completed to parietal peritoneum.
:25	108	110	Parietal peritoneum blocked.
:30	100	110	Eploring finger in the abdomen.
	Ether		
:35	82	110	Ether for freeing appendix.
:38	115	110	Ether stopped; Appendix removed.
:40	86	115	Parietal peritoneum closed.
:45	78	118	Muscles and fascia closed.
11:50	74	115	Skin sutured; Patient awake.

This chart shows the depressing effects of pain in the presence of adhesions and inflammation, indicating use of concomitant etherization with nerve blocking. Note that at the end of operation the pulse was normal and there was no change in blood pressure.

The needles must be kept sharp and clean; the smallest size should always be used for the initial infiltration of the skin.

ADVANTAGES.

As there is no danger of post operative pulmonic, cardiac or nephritic complications following local methods, many operations can be satisfactorily and safely performed in the patient's home, when for any reason he refuses to go to a hospital. The family ironing board makes a convenient operating table—if it has no legs, it can be placed across the backs of two chairs. Either at home, or in the hospital, the patient should be made comfortable on the operating table, which should be well padded with extra blankets or quilts; a hard table will quickly cause him to become tired and restless.

As there is no necessity for speed with the patient conscious and comfortable, fewer assistants are required than with general anesthesia.

Many patients will consent to operation under the local method who would not consider it if it involved a general anesthetic; this applies especially to those who have had a stormy and protracted convalescence after taking ether.

Allen sums up the advantages of the local method as follows: Absence of fear of the anesthetic; absence of post-operative disturbances; no danger of post-operative dilation of stomach or tympanities; no post-operative backache; no vomiting and straining to weaken abdominal incisions; no necessity to starve patient beforehand—the regular post-operative nourishment of debilitated patients is not interfered with.

HERNIOTOMY.

Local Anesthesia. Dr. L. F. Watson.
Left Oblique Ing. Hernia. Mr. D.—Aged 30.
No opiates.

Hour.	Pulse Rate.	Blood Pressure.	Remarks.
9:35	62	130	Before operation.
:40	62	130	Infiltration of tissues.
:43	64	130	Incision completed to Ext. Oblique.
:50	65	128	Blocking regional Nerves.
:52	60	130	Adhesions of sac freed.
:55	58	124	Sac opened and omentum freed.
:58	58	128	Blocking peritoneum at internal ring.
10:00	58	130	Sac ligated and excised.
:05	60	130	Con. tendon sutured to Poupart's lig.
:10	58	130	Suturing Ex. ob. aponeurosis to P. lig.
:15	58	130	Subcutaneous tissues and skin sutured.
:25	58	130	Operation completed.

Throughout the entire operation there was practically no change of pulse rate or blood pressure.

AMPUTATION.

Combined Anesthesia. Dr. L. F. Watson.
Tuberculosis of ankle. Mr. B.—Aged 19.
No morphin.

Hour.	Pulse Rate.	Blood Pressure.	Remarks.
9:40	140	100	Before operation.
:45	140	100	Ether anesthesia; excitement stage.
:50	150	118	Skin incised.
10:05	145	115	Muscle cut and periosteum retracted.
:10	142	100	Tibia and fibula sawed.
:15	142	102	Amputation completed. Ether stopped.
	Local		Nerve blocking of
10:20	140	102	skin and muscles.
:25	135	98	Skin incision for second amputation.
:30	120	100	Muscles incised.
:32	115	100	Periosteum blocked.
:35	110	98	Tibia and fibula sawed.
:40	105	90	Skin flaps trimmed.
:45	105	98	Tourniquet loosened.
:50	112	95	Traction on nerves; vessels ligated.
:55	102	90	Muscle sutured.
11:00	102	94	Skin sutured.
11:01	100	96	Operation complete.

This chart shows the prompt improvement in the pulse under nerve blocking after etherization.

CONTRAINDICATIONS.

The local method is positively contraindicated in the patient who does not want it—who prefers for any reason to be asleep during operation. It is a mistake to urge local anesthesia on the skeptical; and without exception, I administer a general anesthetic to this type of patient.

When there are intra-abdominal adhesions or when the condition is one in which the nerve supply cannot be completely blocked, as is the case in deep pelvic or abdominal operations, a general anesthetic is indicated.

Allen says: "Local actually contraindicated only in children, epileptics, and highly nervous or neurotic subjects. The loss of consciousness is not necessary for the successful performance of an operation, and with the patient' restlessness and possible anxiety allayed by a small preliminary dose of morphine or morphine and hyoscine, the fact that the patient is conscious becomes a negligible factor for the successful completion of the operation."

SCOPE OF LOCAL ANESTHESIA.

In selecting the anesthetic for a major operation, one must first of all consider the risk to life of the patient. Local anesthesia adds greatly to the safety and comfort of the young and robust, and when the patient is handicapped by old age, shock, hemorrhage, pulmonic, nephritic, or cardiac lesions, the local method is especially indicated, if he is to be given the greatest chance for recovery. Allen states that outside of a few large clinics, the mortality of general anesthesia remains as high as it was twenty years ago, in spite of improved methods of administration.

OPERATIONS ON THE EXTREMITIES.

In dislocations, fractures and amputations of the fingers and toes, simple infiltration around the base of the digit is all that is required for successful analgesia. For operations above the wrist and ankle, the regional nerve block method

APPENDICETOMY UNDER LOCAL ANESTHESIA.

1. The initial infiltration is made with the point of the needle, very superficial.
2. The skin is held up and the infiltration continued.
3. The deep tissues are injected.
4. Incision completed down to aponeurosis of external oblique muscle.
5. Infiltration of muscles, aponeurosis and parietal peritoneum.
6. Incision of parietal peritoneum.
7. Appendix in view; the tip is held down by adhesions.
8. Meso-appendix is infiltrated with anesthetic.
9. Appendix freed from meso-appendix and adhesions.
10. Parietal peritoneum blocked with quinin and urea to prevent after pain.
11. Post operative nerve block of skin.
12. Operation completed; patient is free from shock and nausea.

of Matas is most satisfactory and quicker than local infiltration.

OPERATIONS ON THE SKULL.

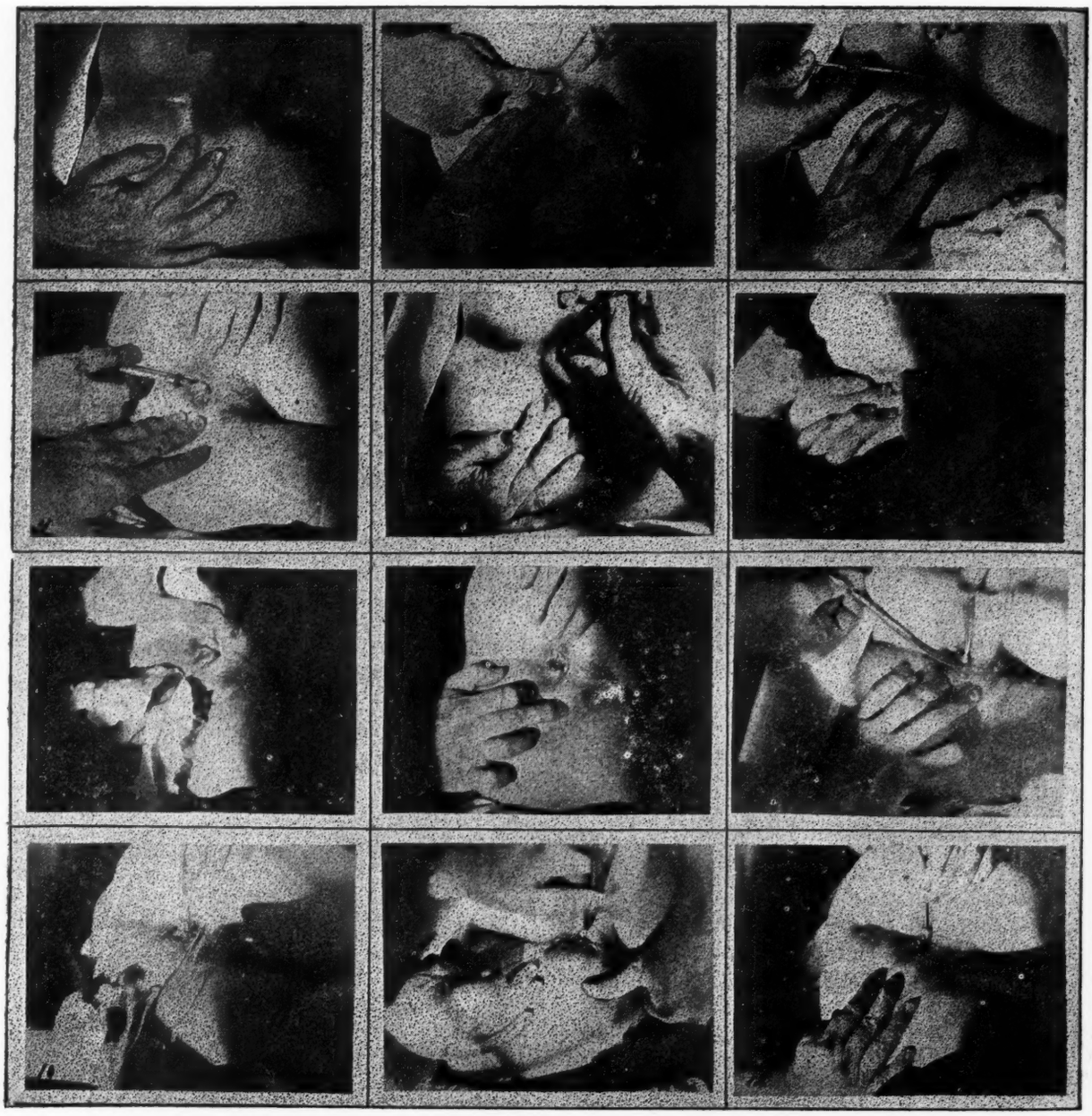
Trephining, exploratory craniectomy, mastoidectomy and removal of depressed fractures are easily performed under local anesthesia, greatly to the safety of the patient. The bone, dura, and brain substance are insentitive. Infiltration anesthesia of the skin, fascia, muscles and periosteum, is all that is needed.

PERINEUM AND CERVIX.

Perineorrhaphy, trachelorrhaphy and cystocele operations can usually be performed under local methods.

MAJOR ABDOMINAL OPERATIONS.

All forms of inguinal, femoral, ventral and um-



HEMORRHOIDECTOMY UNDER LOCAL ANESTHESIA.

Fig. 1. Combined external and internal piles; patient in the Syms position; the external hemorrhoids in view. (2) A pledget of cotton saturated with the anesthetic solution is applied to the anus to produce analgesia of the mucosa. (3) The needle carefully introduced through the anesthetized mucosa infiltrates the mucocutaneous margin of the anus. (4) The skin infiltration is completed. This is sufficient for *external* hemorrhoids. (5) The index finger of the left hand is introduced into the anus and the sphincter muscle located. The muscle is anesthetized by making six to eight punctures at equidistant points around the circumference of the anus, at each injection ten to fifteen minims of solution is infiltrated into the muscle. (6) The sphincter is now painlessly relaxed by digital dilation. (7) This shows the amount of divulsion possible under local anesthesia. (8) With the sphincter relaxed the *internal* hemorrhoids are everted and there is no chance of their being overlooked. (9) The lowest pile is pulled down with a hemostat, and a groove cut around its lower two-thirds, going through the skin and mucosa. This prevents post-operative pain. (10) The ligature is transfixed through the pile to prevent slipping. (11) The ligature is firmly tied in the mucocutaneous groove. (12) This shows the ligature operation completed.

bilical herniae can be operated on under local anesthesia. A general anesthetic is never indicated except in children and the neurotic. For strangulated hernia in patients with lowered vitality, the local method is a necessity to eliminate the additional shock of general narcosis.

Interval cases of appendicitis, selected cases of acute appendicitis, can often be completed under local. In case a whiff of general anesthesia is required for freeing the appendix, the preliminary opening of the abdomen under local is a distinct advantage to the patient in lessening the amount of general narcosis.

In selected cases, I have completed the following operations under local anesthesia: Herniotomy, appendicectomy, nephropexy, cholecystotomy, suprapubic cystotomy and prostatectomy, gastro-enterostomy, colostomy, resection of the tubes and ovaries and suspension of the uterus.

APPENDECTOMY.

Local anesthesia has generally been unsatisfactory in appendectomy. Many operators regard it as being adapted only to selected cases of simple interval appendicitis, in which adhesions are believed not to have formed.

INCISION.

Success with local in appendicitis depends largely on the position of the incision. The McBurney incision is too far removed from the appendix for the local method, because too much manipulation is required to expose the appendix. Many writers have noted that the base of the appendix lies below the McBurney incision in the live subject. Sabotta-McMurrich states "the caecum lies in the right iliac fossa with its lower extremity at the level of the center of Poupart's ligament."

A point one and a half inches from the right anterior superior spine, on the level with a line connecting the two superior spines, should be selected for the beginning of a vertical incision which should extend from this point directly downward for about two inches to the outer side of the upper part of the internal abdominal ring.

ANESTHESIA OF THE MESO-COLON.

In the majority of cases it is necessary to proceed as follows: the caecum is grasped gently with pledgets of gauze and displaced to one side, usually inward, exposing the meso-colon supplying the lower portion of the ascending colon, caecum and appendix. A small quantity of anesthetic solution is injected through a very fine needle at short intervals along the meso-colon for a distance of three or four inches, for the purpose of blocking the cerebro-spinal sensory nerves, which are responsible for the pain following traction on the mesentery and the separation of adhesions. When the patient states that manipulation is painless and without referred epigastric discomfort, the first attempt is made to locate the appendix. While anesthesia continues complete the adhesions are separated, the meso-appendix ligated and the appendix removed in the usual manner. The necessity for gentleness in handling the intestine is important, lest one make unnecessary traction on portions of the mesentery that have not been anesthetized.

CONCLUSIONS.

1. Local anesthesia should be employed only when it is suited to the temperament of the patient, and when the operation is one in which it is possible to block off completely every nerve off sensation, thus preventing all pain.

2. Success with local anesthesia in appendectomy depends largely on making the incision directly over the appendix, and a complete block of the nerves of sensation in the meso-colon.

3. The surgeon should not insist on local for the patient who is skeptical or who does not want it. To such persons a general anesthetic should always be given.

30 N. MICHIGAN AVE.

CAUSES OF FAILURE AND UNTOWARD RESULTS IN CONDUCTIVE ANESTHESIA.*

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NEW YORK CITY.

Unlike numerous *innovations* in dentistry, conductive anesthesia has successfully steered past the shallows and cliffs of *fadism*. Surprisingly few indeed have been the open admissions and reports of failure or untoward results arising from the employment of this method, although the men who have been pioneers and instructors in this doctrine know very well, from consultations and daily correspondence, that disappointments and failures have been attending the efforts of their followers and pupils. To point out the most prevalent and most likely

* Read before the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Associaton, Toledo, O., October 9-11, 1917; and also before the Annual Meeting of the Ohio State Dental Society, Cleveland, O., December 4-6, 1917.

pitfalls that may be encountered in the routine practice of conductive anesthesia, is the purpose of this investigation.

Conductive anesthesia has by no means had an easy road to acknowledgment. The manufacturers of apparatus and the professional advocates of general anesthesia were for several years so busy deprecating the appearance and the advocacy of conductive anesthesia that, in their blind zeal, they heaped a full measure of wrath upon conductive anesthesia —usually without knowing the first principles about it—ruined their own stock-in-trade by belittling the intricacies and exacting requirements of general anesthesia, and overlooked entirely such moderate and truly fair statements as that made by the writer in *Dental Cosmos,* July, 1915, that *"no dental operator who is familiar with but one method of anesthesia should consider himself competent in anesthesia, nor can any dental office which offers anesthetic facilities of but one kind be regarded as efficiently equipped."*

REQUIREMENTS OF AN IDEAL LOCAL ANESTHETIC.

It appears that so far none of the homologues of novocain or the many possible modifications of the synthetic substitutes for cocain measures up to the selected few local anesthetics adopted by the medical profession, for which Braun has set the following standard:

1. The substance must be less toxic than cocain in proportion to its local anesthetic power.
2. The agent must not cause the slightest irritation or tissue injury, but must be absorbed from the place of application without any secondary effects such as severe hyperemia, inflammation, painful infiltrates or necrosis. Only when these conditions are fulfilled can we assume that the healing of wounds will not be interfered with. The use of strongly acid or alkaline substances is not permissible, inasmuch as they cause local tissue injury. On account of this important requirement many of the newer anesthetics have failed in their purposes.
3. The agent must be soluble in water and its solutions stable and possible of sterilization by boiling.
4. It must be possible to combine the agent with suprarenin.
5. For particular places of application, as for instance, mucous membrances, the anesthetic must be able to penetrate rapidly, its anesthetic properties being dependent upon this quality.

NOVOCAIN-SUPRARENIN SOLUTIONS

Coming now to the actual causes for failures in conductive anesthesia, the preparation of solutions merits special attention. Stock solutions or proprietaries are *a priori* objectionable, since their keeping property depends upon antiseptics of some kind or other which, when injected, act unfavorably upon the tissues and frequently produce after-pain or even sloughing. As long as these concoctions are administered by way of infiltration only, the possible damage, which is of necrotic nature, may be confined to relatively superficial strata of tissue; for conductive anesthesia, however, their employment involves serious risk. The remedial alleviation of such untoward results, moreover, is complicated by the operator's ignorance of the quantity and nature of the antiseptics admixed, placing him in an extremely disadvantageous position medico-legally. Conscientious operators will strictly adhere to the principle that, if a patient is worth while treating, he is worth while making a fresh solution of definite constituency and percentage for.

Attempts have been made to combine the physiologic amount of sodium chlorid or Ringer ingredients with novocain-suprarenin to save the time and trouble of making a normal salt or Ringer stock solution separately. This like other admixtures is contraindicated as the combination of NaCl and suprarenin is unstable, and such combination tablets almost invariably yield discolored solutions.

This disadvantage was pointed out by the writer as early as 1914 (Dental Cosmos, December, 1914): "The addition of sodium chlorid to novocain-suprarenin tablets for the purpose of simplifying the preparation of isotonic solutions as practiced by some drug houses, should be discouraged, since they give discolored solutions within a very short time after purchase, and especially after a tube has been broached, proving that the combination of novocain-suprarenin and sodium chlorid is very unstable, chiefly owing to the hygroscopic property of sodium chlorid."

Nevertheless, a United States Patent upon this combination in principle has been granted.

Improper methods of preserving the tubes in which tablets are marketed, are a prolific source of annoyance to the operator. Prolonged exposure to heat, light and moisture results in decomposition of the tablets despite the precautions in packing exercised by the manufacturers. Dentists as a rule are very careless in their manner of preserving drugs, as a glance at the carbolic acid, silver nitrate, hydrogen peroxid or iodin contained in the average medicine cabinet will attest. The writer has been able to preserve tubes of novocain-suprarenin tablets without decomposition for years by placing his stock in a tightly closed Mason jar set in an equally tight tin bucket, which combination seems to act as a sort

of improvised thermostat when set away in a dark, cool closet of even room temperature. Additional stability of tablets is insured by dipping unbroached tubes into a solution of low-melting paraffin. Not more than one tube is ever broached at one time, and the sterile cotton and rubber stopper are immediately replaced under aseptic precautions. Prolonged direct contact between the uppermost tablet and the rubber stopper results in a reaction between the tablet and the sulphur in the rubber as manifested by brown discoloration of the tablet. It seems also that tablets prepared and packed during humid summer days are more prone to discoloration than those made up during the cooler months.

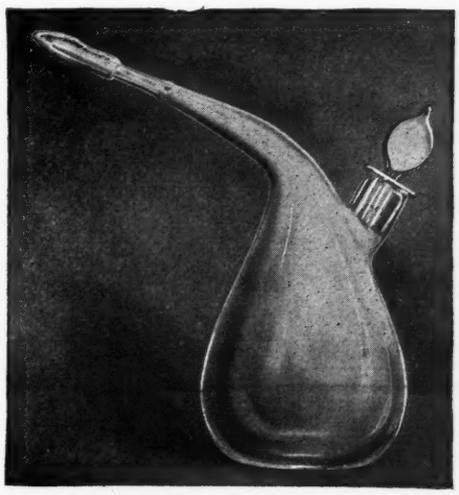


Fig. 1. Author's improved container for Ringer Solution.

Discolored solutions are viewed by most operators with suspicion and rejected. When this discoloration is due to intrinsic decomposition of the tablets or to organic contamination or alkalinity of the distilled water or the dissolving cup, this attitude is not only justified, but imperative. If, however, all precautions of asepsis have been carefully followed, and the solution which immediately after boiling was clear assumes a pinkish shade attributable to oxidation, heat and light, it may be employed with impunity. The writer has never observed any toxic symptoms following the injection of sterile though slightly discolored solutions. It goes without saying, of course, that dust, particles of saliva distributed in the air by breathing and speaking, or alkaline vapors from soap and sodium bicarbonate which ever pervade the air of an operating room must be excluded by covering the dissolving cup with a plate of colored glass or of porcelain, which is readily sterilized by passing the surface which comes in contact with the rim of the cup over an alcohol flame.

It has been observed that some operators fill their dissolving cup with Ringer solution, add the novocain-suprarenin tablets to the cold solution and boil. This procedure is reprehensible because the tablets come in almost direct contact with the flame at the bottom of the cup where they are roasted, as it were,

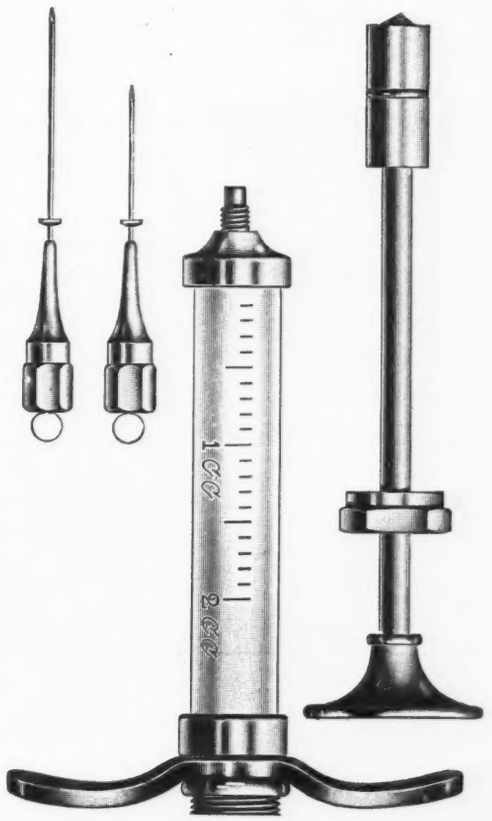


Fig. 2. This syringe holds 2½ c. c. In its design, delicacy and lightness have been prime considerations. It is an all glass and metal syringe without washers of any kind, which for purposes of sterilization is taken apart in two sections. The glass and metal are annealed in such a way as to permit of vigorous prolonged boiling. All gnarled corrugated surfaces are avoided, and all corners are rounded off and the piston is made to end in a graceful indented end in which the ball of the thumb fits snugly. The cross-bar moves readily and the barrel is long enough so that the operator's second and third fingers find ample working space between cross bar and cheek so as not to obscure the field of vision. Altho very light pressure only is required in conductive anesthesia, the syringe is tested to 30 lbs. pressure so as to allow of infiltration without regurgitation. To prevent the migration of a broken needle into deeper strata of tissue, the needles have been provided with a safety disc, wider than the lumen of the needle perforation, so that the needle fragment is automatically arrested. Since, according to the laws of mechanics, the needle, no matter whether of steel or iridio-platinum, must break at the orifice of the hub to which the needle is attached, the risk of losing a needle is eliminated, which fact may be especially appreciated by the beginner. To facilitate finding the inclination of the bevel of the needle, a mark is placed on the hexagonal hub in such a way that visibility of the mark indicates pointing of the bevel of the needle toward the bone. To avoid confusion the hubs of steel needles are nickel-plated, those of iridio-platinum are gold-plated.

long before the Ringer solution approaches boiling point. Such combined roasting and unduly prolonged boiling greatly impairs the clearness and stability of the resulting solution.

If hydrochloric acid is used to overcome the alkalinity of ordinary glass containers, great caution is advised not to over-acidulate, since intense and prolonged afterpain will follow injection of such solu-

tions. Alkali-free glass containers are now readily obtainable.

DISTILLED WATER

The use of contaminated distilled water of the average drug store variety cannot be too severely condemned, as it is conducive to afterpain, sloughing and even suppuration, as has been demonstrated by animal experimentation. The most satisfactory distilling apparatus is one of glass of the sort devised by Dr. Silverman and others. The first portions of the distillate should always be rejected, as it contains dust and carbon dioxid accumulated in the still. If any doubt exists in the operator's mind as to the absolute purity of the distilled water used by him, he should subject it to the simple tests prescribed by the U. S. Pharmacopea. The operator's stock of distilled water is to be kept in a double, ground-glass, stoppered, non-alkaline glass flask covered by a hood of sterile gauze. Ringer stock solution can be kept sterile for weeks in the non-alkaline glass stock bottle designed by the writer, and herewith illustrated, into which air is admitted only through a wad of sterile cotton held over the small holes in the stop-cock and intake which are brought into line by a turn only when Ringer solution is actually needed. It is good practice to renew Ringer solution every week, sterilizing it in a water-bath after removing stop-cock and nozzle hood and protecting the two outlets of the bottle with sterile cotton or gauze.

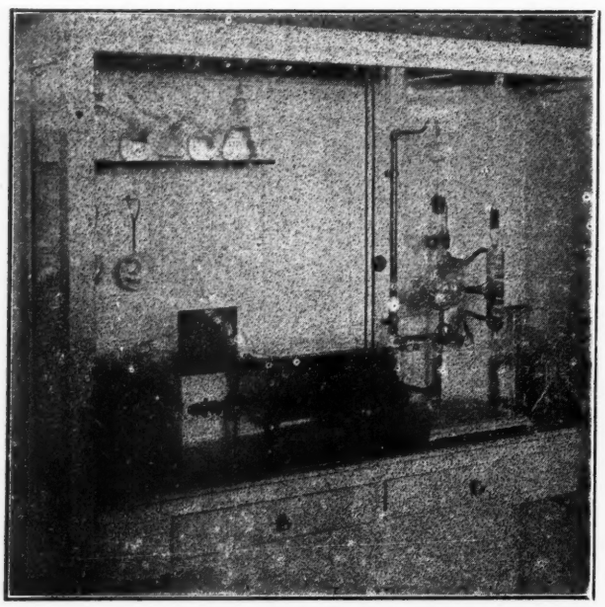


Fig. 3. Aseptic wall-cabinet for storing water-still instrument sterilizer, syringe jars, boiling cups and flasks of distilled, sterile water.

TOXITY OF NOVOCAIN-SUPRARENIN SOLUTION

A great deal has been said and written about the toxic symptoms produced by novocain-suprarenin solutions, and their appearance is usually, though wrongly, attributed to the admixture of suprarenin. Braun, and quite recently again Silverman, have conclusively shown that this toxicity is not due to the suprarenin but to the novocain itself. This is also borne out by the study of G. B. Roth, of the U. S. Public Health Service, who states that *"the depressing effect of novocain on the blood pressure and respiration of animals makes it necessary to use caution in its administration in clinical cases in which the blood pressure is low or in which the heart is at fault,"* and that *"great care should be exercised in the injection of novocain subcutaneously, in order to avoid entrance into the circulation, thereby increasing its toxicity."* In this connection it is advisable, however, to remember Mayo's timely warning that animal experimentation is not conclusive proof and that clinical observation in man alone can arrive at the truth which the test tube brigade can only distantly sight in their experiments on frogs, rats, cats and guinea-pigs. The writer's own clinical observations tend to emphasize the advantage of a tablet of a higher percentage of suprarenin in the dental tablet *E*, giving the stimulating effect of that drug, over the lower percentage in tablet *T*, except in hyper-thydroidism or patients with high blood pressure. The more pronounced and longer anemia produced by tablet *E* is of decided advantage to the oral surgeon in regard to better visibility of the field of operation. The disadvantage of this anemia as far as clot-formation and wound healing are concerned, are fully overcome by manipulation, massage or scarification of the wound ensuring a free flow of blood before completion of the operation.

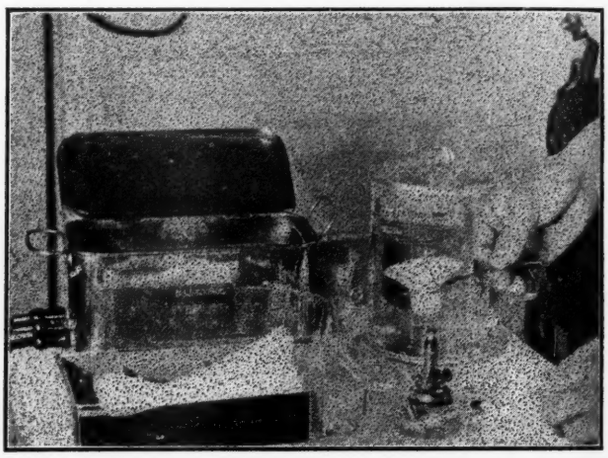


Fig. 4. Table and equipment devoted exclusively to the preparation of novocain-suprarenin solutions. Sterilizing solution in porcelain cup over an alcohol flame.

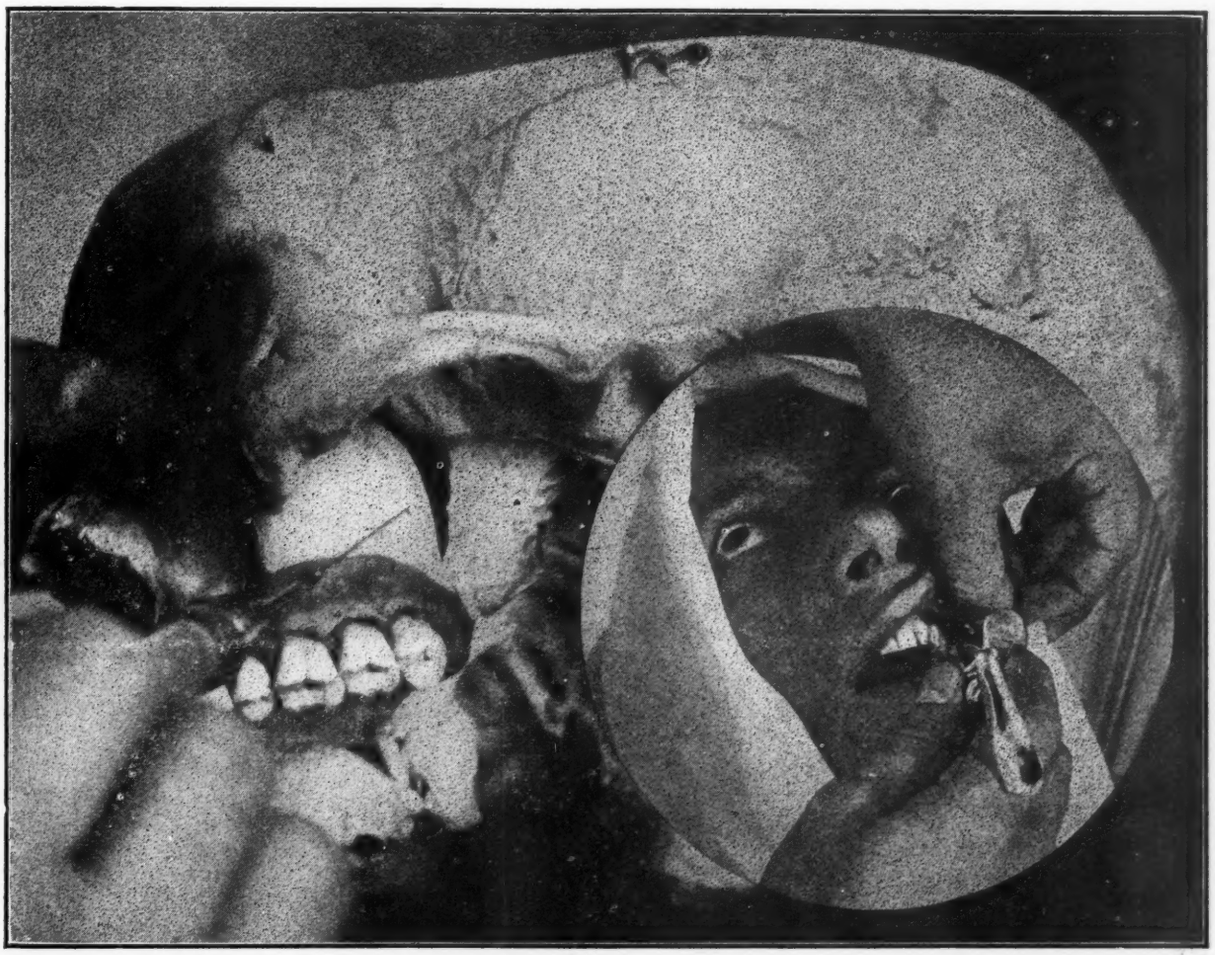
Slow injection with just enough pressure to evacuate the syringe is the most efficient means for avoiding toxic symptoms which occur far more fre-

quently in the infiltration of small quantities of solutions under excessive pressure, than in the deposition of incomparably larger quantities under practically no pressure in conductive anesthesia.

Both the operator's and the patient's individualities determine to a large degree the character and intensity of toxic symptoms which accordingly may vary from slight pallor to syncope. Proper diagnosis and selection of cases from physical, pathological, racial, social and psychic points of view are of paramount importance in the avoidance of untoward results. This phase of the question, which may be summed up in the word *shock,* has been treated in the writer's paper on "Anoci-Association in Dentistry," (Dental Cosmos, July, 1915), where the choice of anesthetic, pre-operative medication and therapeutic measures in collapse are discussed in detail, also in "Local Anesthesia in Dentistry" under the heading of "Accidents Following Novocain Injections." As a primary measure of precaution, patients who are to be subjected to local anesthesia should always be specifically advised to eat a hearty meal previous to presenting themselves for dental or surgical operations. This precaution, which is contrary to our methods of preparing patients for general anesthesia, will practically eradicate all tendency to faintness.

The usual symptoms of toxic effects in the various types of patients may be briefly summed up as follows:

Weakly anemic patients are prone to pallor and slight trembling of the extremities, which passes off rapidly with deep breathing, or the internal administration of aromatic spirits of ammonia or camphorated validol, or upon the inhalation of strong ammonia or amyl nitrite, ethyl chlorid or ether. In *cardiacs,* distressing sensations in the heart region, shallow and rapid respiration and the appearance of perspiration on the forehead are noted, these symptoms quickly disappearing. The *bilious tempera-*



Figs. 5-6. Right Tuberosity Injection.—The posterior and middle alveolar foramina, located back of the maxillary tuberosity, below and behind the zygoma, give passage to the posterior and middle superior alveolar nerves, innervating the soft tissues facially, the bone and pulps of the first, second and third molars, and first and second bicuspids. The needle is inserted in the reflection of the mucous membrane back of the distal root of the first molar and advanced on the bony surface without discharging solution—in an upward, backward and inward direction. When the needle is inserted to full length, 3-4 of the contents of the syringe are discharged. If the bicuspids are also to be obtunded the remaining 1-4 of the syringe contents is discharged as the needle is withdrawn. Patient's head in reclining posture; mouth closed, cheek retracted. Quantity of solution 2 cc.

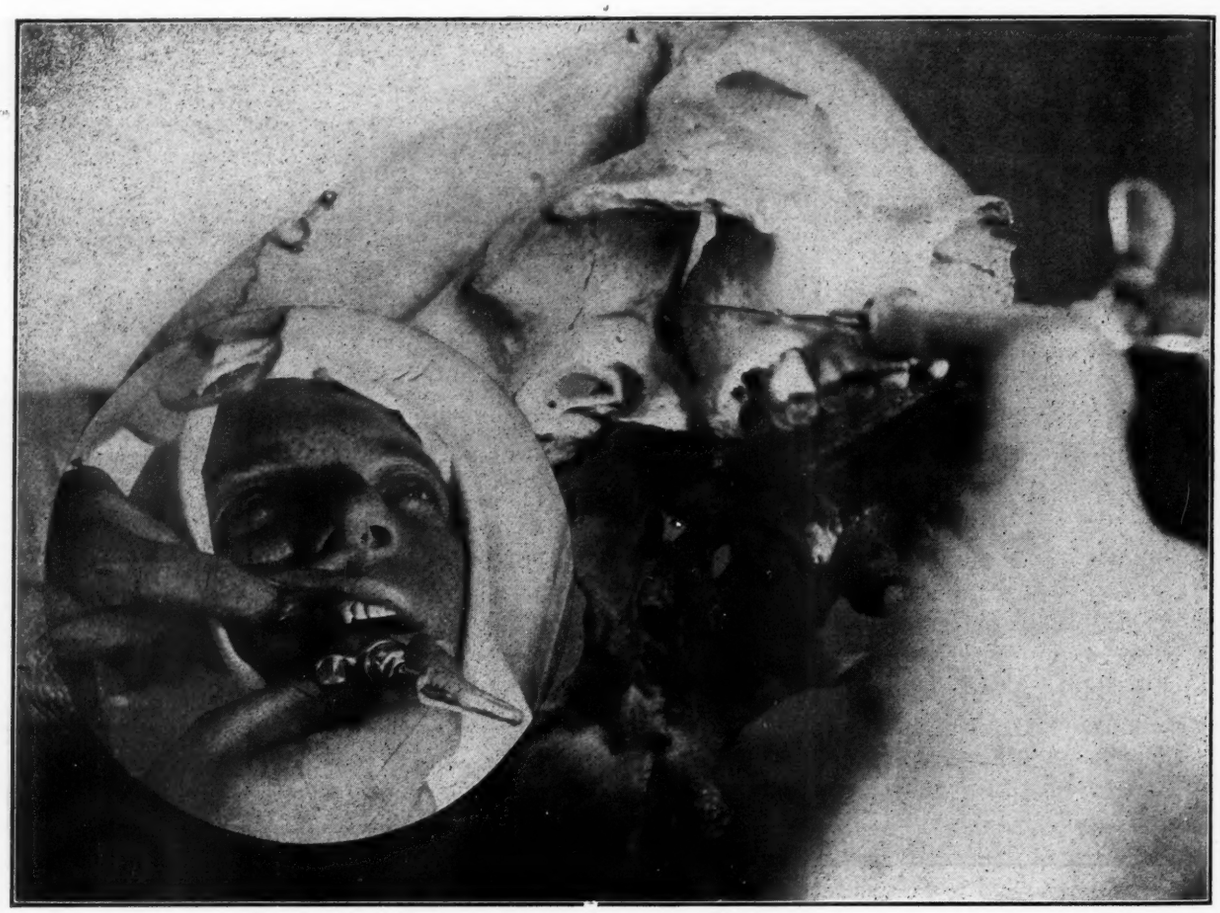
ments seem to be most pronouncedly affected, but in these also as well as in advanced stages of *nephritis,* slow injection of 1 per cent. solutions and the operator's reassuring attitude help the patient rapidly across the first five critical minutes within which toxic symptoms usually appear.

In persons with *high blood pressure,* the administration of mild narcotics previous to injection insures good results. Bromural "Knoll" (alpha-brom-isovaleryl-urea) 2 tablets equal 0.6 gram, to be taken with water 30 minutes before making the injection has given the writer greatest satisfaction, although other sedatives such as chloralhydrate, morphin in conjunction with scopolamin or hyoscin have their advantages.

In *neurotics or hysterics,* the problem is of course a much more complicated one, since we are dealing with psychopathic conditions, in the successful treatment of which the operator's personality in its appeal to the patient's psyche is a deciding factor.

Epileptics can be treated successfully if the operator will select the period half-way between the usually chronically occuring attacks. As a matter of gratification the writer wishes to state that in his clinical experience, including every imaginable *bad risk,* he has observed but two disconcerting reactions in neurotics.

Children seem practically immune to both 1 and 2 per cent. solutions, which, of course, is accounted for by the fact that usually the robust and healthy are the courageous ones who do not fear the needle, or that the operator by a few kind words striking the level of the childish mind gains the little patient's full confidence. It is remarkable indeed how devoid of any toxic reaction conductive anesthesia can be practiced on the children of the slums or inmates of asylums and tuberculosis institutions, whose physical condition is far below par.



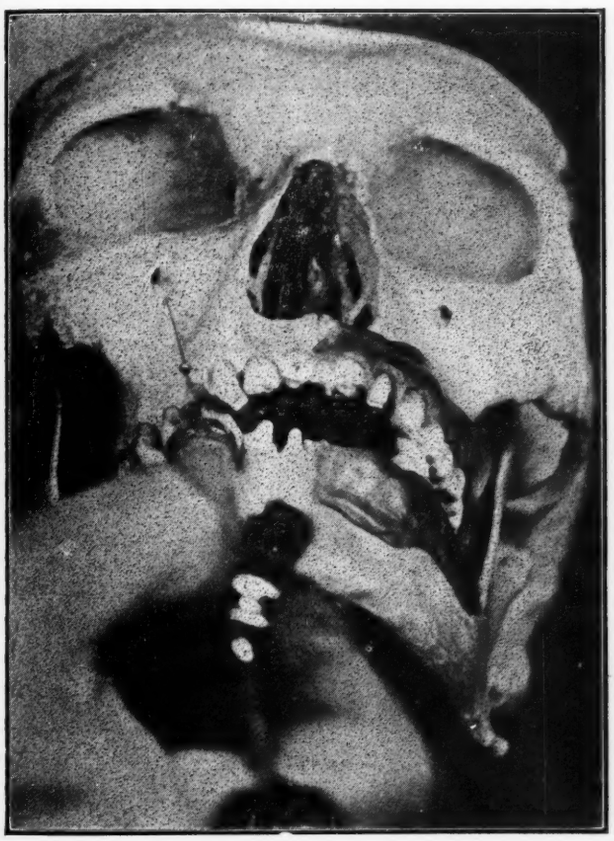
Figs. 7-8. Left Tuberosity Injection.

Within 14 months of tri-weekly attendance as surgeon to the Department of Oral Surgery of the N. Y. Throat, Nose and Lung Hospital and to the German Hospital Dental Dispensary I have observed but one case of fainting in an undernourished and nervous girl of 15 years of age, faintness being due to unduly rapid injection and lasting but three minutes. Previous to that, I have had occasion to observe tendency of fainting in a hysterical young woman, Italian, 17 years of age, as Instructor in the Dental Department of the Medico-Chirurgical College of Philadelphia, and again as Instructor in the

Post-Graduate School of Philadelphia in a man of 40 years who had made up his mind and signified his intention to faint.

INSTRUMENTARIUM

The necessity of asepsis of instrumentarium requires no special accentuation, although the lack thereof is one of, if not *the,* most common causes of afterpain and infections. Simplicity of instrumentarium engenders continuity of the delicate chain of asepsis, breaks in which are the more likely to occur the more complicated the apparatus used. All-



Figs. 9-10. Right and Left Infraorbital Injections. The infra orbital foramen, emitting the anterior superior alveolar branch, innervates the soft tissues facially, the bone and pulps of the central, lateral incisors and the canine. Owing to anastomosis of the middle superior alveolar branch the first bicuspid is also obtunded. Palpate lower border of orbit on face, press index-finger over infraorbital foramen. The needle is inserted in the reflection of the mucous membrane distally to the canine root, advancing needle to about ½ its length, while continually discharging solution until the needle is felt under the palpating finger. Patient's head in reclining posture, mouth closed, upper lip retracted with the thumb. Quantity of solution 1 cc. to 1.25 cc.

glass-and-metal syringes without washers of any kind permit of most simple and effective sterilization. The liquid most suitable for keeping sterilized syringes in is 70 per cent. alcohol with admixture of a small quantity of glycerin, which must be washed out from the inside of the barrel by drawing in it boiling distilled water several times to avoid the introduction of alcohol into the tissues and causing unduly prolonged anesthesia of the injected area due to the well-known action of alcohol on nerve tissues. Experiments with sterilizing fluids other than frequently renewed alcohol have proven unsatisfactory. Formaldehyd solutions especially are contra-indicated on account of their action upon novocain and the severe pain induced by the accidental subcutaneous injection of even minute quantities.

In the selection of needles, those of small lumen are preferable, as a stout needle manifestly is more liable to cause pain and traumatism on introduction. The extremely disagreeable accident of breaking a needle, which occurs most frequently in mandibular injections, is robbed of its terrors by the safety needles designed by the writer and herewith illustrated. These needles are constructed so that the break, if it occurs *in vivo,* comes to lie back of the safety disc, which prevents the fragment from disappearing in the tissues. Iridio-platinum needles seem most suitable for private practice, as they do not rust and are easily sterilized after every insertion by drawing through an alcohol flame, while steel needles clog unless a wire is inserted after every use; require at least 30 minutes' boiling to be sterile, and even then may rust and break anywhere along the course of the cannula. The sterilization of steel needles can be very quickly accomplished if instead of boiling, the needles are dipped in a vessel containing molten Wood's or Melotte's

metal. This method is based upon the argument that the needle is exposed practically to the heat of the flame in the absence of atmospheric air, thus preventing oxidation and loss of temper while destroying even the most virulent bacteria. The carrying of infections by needles from one part of the mouth to another or from mouth to mouth, is criminal negligence, and, it is to be hoped, of rare occurrence.

The syringe and safety needles designed and used by the writer have given him and a large number of practitioners full satisfaction.

METHODS OF CONDUCTIVE ANESTHESIA

Although various attempts have been made by operators and teachers to attach their name to modifications of the technic of conductive anesthesia, it should be emphasized that all these modifications have been foreseen by Braun upon whose painstaking researches conductive anesthesia is based. Since

Fig. 11. Left Anterior Palatine Injection. The anterior or incisive foramen is located in the median line back of the incisive papilla and emits the naso-palatine nerve, innervating the soft tissues palatally from canine to canine. The needle is inserted a short distance anteriorily to the incisive papilla, injecting under light pressure, advancing cautiously and slowly to a short distance posteriorily. Patient's head in reclining posture; mouth wide open. Quantity of solution 0.25 cc. or ⅛ contents of syringe.

this basis is an anatomical one, there can be little variation or improvement over the basic principles established by Braun and adopted for dental practice by Fisher, Williger, Bünte, Moral, Seidel and others. It is feared that a confusion may arise in the beginner's mind as to specific merits of any one so-called method; in fact, the many questions addressed to the writer in that respect seem to indicate that the confusion has already started, which is surely not to the best interest of standardization which the dental profession is so eagerly striving to attain. The prime requisite for successful technic is a thorough familiarity with the anatomy of the head, and it is rather a slur upon the dental profession that certain *shot-gun* drugs are advertised as requiring no special knowledge of dental anatomy for successful administration. Not only should this familiarity with the anatomy of the parts concerned be acquired from general and special textbooks, but practical experience on patients is paramount. Anatomic specimens are of great value, but better yet is the dissection of a green head after previous injection of some dye-stuff at the foramina concerned. In this manner the student becomes acquainted with the arrangement of the tissues upon which he is working.

ANESTHESIA OF THE UPPER BICUSPIDS.

Reports concerning the extent of anesthesia produced by tuberosity injection seem to vary as widely as the opinions of anatomists regarding the course of the superior middle alveolo-dental branch. This branch, if it exists—and some anatomists claim it does not—may present the following variations in course. It is either given off from the large infraorbital branch within the infraorbital canal and runs from there in the mucosa of the maxillary antrum to the upper bicuspids without appearing upon the facial surface of the maxillary bone; or it is inserted together with the posterior branch at the cribriform plate; or it is inserted in foramina situated anteriorly thereto. The examination of numerous skulls and clinical observations tend to point out that the latter two conditions are present in at least 75 per cent. of cases. If the long needle is inserted in the reflection of the mucous membrane back of the distal root of the first molar, in other words, between first and second molars, and advanced on the bony surface, without discharging solution in an upward, backward and inward direction at an angle of about 45° with the masticating surfaces of the upper molars, and 1½ c. c. of solution are injected when the needle has been introduced to full length; if then in slowly withdrawing 1 c. c. of solution is discharged as the needle is withdrawn, thus leaving a deposit of solution from the cribriform plate to the reflection of the mucous membrane; then, the three molars and two bicuspids together with the soft tissues connected therewith are satisfactorily anesthetized. It is of little practical value to argue how this anesthesia is obtained. Suffice it to say that either the posterior and middle branches are blocked simultaneously at the cribriform plate or, if the middle branch is inserted in its own foramina anteriorly to the cribriform plate, it is blocked there as the needle is withdrawn, or if the middle branch descends within the antrum, enough solution penetrates the canaliculi in the cortical facial bone to produce bicuspid anesthesia. If the first bicuspid is only partly anesthetized, as happens

in some cases, this is due to the anastomosing fibres of the anterior branch. Most operators seem to insert the needle too far posteriorly and at too obtuse an angle, thus getting way beyond the cribriform plate, and yet not deeply enough into the spheno-maxillary fissure to block the maxillary branch in toto. Stern's suggestion of using the long needle in the bayonet-shaped hub has not given any better satisfaction. In all cases where the operator attempts an injection at a very obtuse angle a great deal of his solution seems to be deposited in the very heavy layer of areolar tissue overlying the cribriform plate and filling the spheno-maxillary fissure, so that very little solution is left for blocking the nerve branches. This will also explain the observation of some operators who obtain only partial anesthesia of the first molar.

Figs. 12-13. Left Posterior Palatine Injection. The posterior palatine foramen is located in the palate on a line joining the last molar teeth present; it emits the anterior palatine nerve innervating the soft tissues palatally from the third molar to the first bicuspid inclusive. The needle is inserted as for infiltration of the palatal root of the last molar, then advanced slightly toward the foramen, while discharging drops of solution. There is danger of going too deeply and directly into the foramen. The patient's head is in the reclining posture, mouth wide open. Quantity of solution 0.25 cc. or ⅛ contents of syringe.

PAIN DUE TO INJECTION

Any pain caused by the insertion of the needle is directly attributable to faulty technic. The only tissues which may be sensitive to the passage of the needle are the mucosa and sub-mucosa. For the rest the needle should advance slowly through areolar, soft, fatty and connective tissues which have no sensory innervation. The mucosa and sub-mucosa are rendered insensitive, at the same time sterilized, by the topical application of the iodin-menthol-benzol mixture suggested by the writer (Iodin crystals, 10 parts; menthol crystals, 10 parts; benzenum U. S. P., 80 parts). This stable solution will not produce the sloughing following the application of ordinary tincture of iodin which must be not older than one week, else it will decompose into hydriotic acid, while benzol will preserve iodin indefinitely. This iodin-menthol-benzol mixture is also a valuable indicator as to whether a patient is suitable for conductive anesthesia. Nervous patients and children who object and utter complaints upon application of this solution, which has a slightly smarting then cooling effect, are best subjected to a general anesthetic.

(To be continued.)

American Journal of Surgery

QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

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Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement.

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F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

JULY EDITORIALS. **1918**

ARE YOU DOING YOUR BIT?

While a large number of expert anesthetists have answered the Call to the Colors and are in active service at the Front or in the cantonment hospitals at home or in the training schools for medical officers, there is need for many more to enter the medico-military service. Surgeon General W. C. Gorgas is anxious to mobilize the allied professions in such a manner that no matter what the army or civilian needs may become they can be adequately met.

You have a place in this mobilization and the Editor of the Supplement, in cooperation with those in authority and in behalf of the Associations of Anesthetists, will do all in his power to assist you in doing your bit.

Do not let the fact that medico-military service will not be entirely devoted to the administration of anesthetics deter you from applying for and accepting a commission. Once in service you will find thousands of opportunities for being invaluable and opportunities for giving more anesthesias that you ever dreamed could be crowded into such brief periods of intense activity, will periodically arise. Unless all those competent to do this work offer their services many of the wounded will be deprived of the beneficence of anesthesia.

Those in authority have taken a very progressive step in according women physician anesthetists contract service with the rank of Lieutenants. The patriotic women of the profession and its specialties deserve this recognition and there is not the slightest doubt of their making good.

At present an effort is being made to have those in authority recognize the dental anesthetist as fully competent to serve side by side with his fellows of the medical profession. The quota for the Dental Reserve Corps has been trebly oversubscribed and hundreds of other dentists are still anxious to enroll. Places can and, it is hoped, will be found to enable them all to do their bit.

It is interesting to note that after three and a half years of war and persistent urging by leading anesthetists, that the British army medical authorities have finally established a large training school for anesthetists. This school is located at a large military hospital in Buxton, England, and is in charge of Major Robson. Only medical officers are being trained in this special work.

At the Front it has been found that anesthesia is a specialty that demands all the resources of a full medical or dental course and a number of years training in the specialty. Presently the need for more anesthetists will require extended training and it is to be hoped that those in authority will solve the problem in the same manner as their British confreres. In so doing they will have the support of all concerned.

In the meantime the anesthetic resources of the country are being mobilized and if you can possibly serve in any way put yourself in touch with the Editor of the Supplement. If you are incapacitated for active service relieve some fellow anesthetist who can and will go. If you have to remain at home see to it that the hospitals in your vicinity do not suffer from lack of anesthetic service.

At the Present time there are many members of the medical and dental professions who wish to perfect themselves in the art of anesthesia and if you are competent to instruct put yourself at the disposal of the Associations of Anesthetists for this work.—McM.

THE INTERSTATE ASSOCIATION OF ANESTHETISTS WILL HOLD ITS FOURTH ANNUAL MEETING IN INDIANAPOLIS, INDIANA, SEPTEMBER 25-27, IN CONJUNCTION WITH THE INDIANA STATE MEDICAL ASSOCIATION, WHICH HAS ACCORDED IT THE COURTESY OF A JOINT-SESSION. ALL ACTIVITIES OF THE MEETING WILL CENTER IN THE HOTEL CLAYPOOL. AN INTERESTING AND INSTRUCTIVE SCIENTIFIC PROGRAM HAS BEEN ARRANGED. THE VISITING LADIES, AS USUAL, WILL BE DELIGHTFULLY ENTERTAINED. YOU ARE CORDIALLY INVITED TO ATTEND.

Society Proceedings

Membership in a society devoted to your specialty is an essential to success.

INTERSTATE ASSOCIATION OF ANESTHETISTS.

The Interstate Association of Anesthetists will hold its Fourth Annual Meeting in Indianapolis, Ind., September 25-27, 1918, in conjunction with the Indiana State Medical Association. The activities of this meeting will be centered in the Hotel Claypool. The Indiana State Medical Association has accorded the Interstate Anesthetists the courtesy of a Joint-Session on the afternoon of September 26. A special Section on Anesthesia for Oral Surgery and Dentistry is also in preparation.

Among the special features of the program, the following may be announced in advance:

Some Clinical Observations on Nitrous Oxid in Cesarean Section and Operative Obstetrics and on the Depth of Anesthesia as Affecting the Mother, Child and Uterus, E. I. McKesson, M.D., Toledo, O., (Chairman's Address); Anesthesia in the Curriculum and Clinic, Willis D. Gatch, M.D., Indianapolis, Ind.; Ether Hypnosis in Psychotherapy, Frank R. Starkey, M.D., Detroit, Mich.; Etherization in the Therapy of Tuberculosis, Walter E. Savage, M.D., Cincinnati, O.; A Clinical Study of Blood Pressure, Pulse Pressure and Hemoglobin in Postoperative Shock, Hemorrhage and Cardiac Dilitation, John O. Polak, M.D., Brooklyn, N. Y.; Warmed Chloroform-Ether Vapor Anesthesia in War Surgery, Francis E. Shipway, M.D., London, England, and M. S. Pembrey, Ph.D., Edinburgh, Scotland; What the Expert Anesthetist Should Be, A. S. McCormick, M.D., Akron, O.; Some Experimental Observations on Blood Changes Due to Anesthesia, W. E. Burge, M.D., Urbana, Ills.; Vapor Anesthesia for Oral and Facial Surgery, Wm. Hamilton Long, Louisville, Ky., and Some Recent Researches in the Physio-Pathology of Anesthesia, John A. Higgins, M.D., Chicago, Ills. Other papers are in preparation and will be announced on the completed program.

As usual the visiting ladies will be delightfully entertained and will be welcomed to the Annual Dinner. Those contemplating attending should make their hotel reservations early.

The following are the officers for the Fourth Annual Meeting: E. I. McKesson, M.D., Toledo, O., Chairman; John J. Buettner, M.D., Syracuse, N. Y., Vice-Chairman; F. H. McMechan, M.D., Avon Lake, Ohio, Secretary-Treasurer; and Members of the Executive Committee, Bion R. East, D.D.S., Detroit. Mich.; Wesley Bourne, M.D., Montreal, Canada; E. F. Horine, M.D., Louisville, Ky.; Thomas L. Dagg, M.D., Chicago, Ills.; E. M. Sanders, M.D., Nashville, Tenn., and Paul Cassidy, D.D.S., Cincinnati, O.

Those surgeons, specialists, anesthetists and dentists who are interested in the progress of anesthesia are cordially invited to attend.

For further particulars, membership, dues, and dinner reservations, address

F. H. McMechan, M.D., *Secretary*,
Avon Lake, Ohio.

AMERICAN ASSOCIATION OF ANESTHETISTS SIXTH ANNUAL MEETING.

The Sixth Annual Meeting of the American Association of Anesthetists was held in the South Parlor of the Auditorium Hotel, Chicago, Ill., June 10-11, 1918. Owing to the untimely death of Dr. F. W. Nagel of Montreal, Canada, early in the year, Acting President Albert H. Miller, M.D., of Providence, R. I., presided. In the absence of Capt. J. T. Gwathmey, M.R.C., in Paris, F. H. McMechan, M.D., Avon Lake, O., acted as Secretary.

During the executive session of the Association the Minutes of the 1917 meeting and the Secretary-Treasurer's report were accepted as read. The following officers were elected for the coming year:

President, Major W. B. Howell, M.D., C.A.M.C., Montreal, Canada; Vice-Presidents, Joseph E. Lumbard, M.D., New York City, and Myra E. Babcock, M.D., Detroit, Mich.; Secretary-Treasurer, F. H. McMechan, M.D., Avon Lake Ohio; and Members of the Executive Committee, Harrington Marr, M.D., Nashville, Tenn., and John W. Seybold, M.D., Denver, Col.

The resignation of Capt. J. T. Gwathmey, M.R.C., as Secretary-Treasurer was very reluctantly received and accepted. Capt. Gwathmey fathered the organization of the American Association of Anesthetists at the A.M.A. meeting in Atlantic City, N. J., June 12, 1916, and acted as its first President at the Minneapolis meeting in 1913, after which he assumed direction of the association as Secretary-Treasurer. What success the A. A. A. has achieved has been due to Capt. Gwathmey's untiring efforts. Following a *viva voce* vote the Acting President appointed Drs. Seybold, McMechan and Miller, as a committee to express to Capt. Gwathmey the appreciation of the organization for his work in the past and to extend him the association's best wishes for the future. This committee was also empowered to extend to the wife and family of Dr. F. W. Nagle the association's sense of loss and bereavement on his sudden and deplorable death. Dr. Nagle was to have been the A. A. A.'s first Canadian President.

The association voted unanimously to extend its complete coöperation to the Surgeon Generals of the Army and Navy in perfecting the mobilization of the anesthetic service for medico-military preparedness, and the Secretary-Treasurer was empowered to use the funds of the association to circularize the anesthetsts to secure any number of experts desired.

A discussion as to the time of meeting resulted in a decision to try out the policy of evening sessions again. It was suggested that at the next meeting complete information be placed in the hands of the A. M. A. information bureau for distribution to all in attendance.

W. F. Curran, M.D., Waco, Texas, and T. T. Church, M.D., Salem, Ohio, were elected to membership. The resignations of C. E. Boys, M.D., Kalamazoo, Mich., and Frederick J. Cotton, M.D., Boston, were accepted with regret. Other resignations were tabled and the association voted to remit the dues of those in service, and continue their membership.

During the two Scientific Sessions the following papers were presented and discussed

The Anesthetist's Day's Work (Acting President's Address), Albert H. Miller, M.D., Providence, R. I.

Some Observations on Teaching the Pharmacology of Anesthetics, Torald Sollman, M.D., Cleveland, Ohio.

Accidents from Local Anesthetics—a Preliminary Report, Robert A. Hatcher, M.D., New York City.

The Operative Risk in Cardiac Disease, F. A. Willius, M.D., Rochester, Minn.

Blood Pressure as a Guide During Major Operations, Harold G. Giddings, M.D., Boston, Mass.

Recent Studies in Post-operative Pneumonitis, Allen O. Whipple, M.D., New York City.

Experiences of an Anesthetist at the Front, Major W. B. Howell, C.A.M.C., Montreal, Canada.

Deaths During and After Operations in Relation to the Surgeon, the Anesthetist and the Hazardous Risk, E. M. Sanders, M.D., Nashville, Tenn.

Nitrous Oxid-Oxygen Analgesia in Normal Labor and Operative Obstetrics, W. C. Danforth, M.D., Evanston, Ill.

Combined Anesthesia for Cesarean Section, J. Clarence Webster, M.D., Chicago, Ill.

Gas-Oxygen Analgesia in Daily Practice, Will Walter, M.D., Evanston, Ill., and

The Prophylactic Use of Pituitrin for Hemorrhage in Nose and Throat Operations under General and Local Anesthesia, Samuel Salinger, M.D., Chicago, Ill.

As these papers will be printed in full in the Supplement there is no occasion to refer to them more fully in this brief report.

The Annual Dinner was served in the Auditorium Hotel and, considering the number of members in active service, was well attended and thoroughly enjoyed. A number of the visiting ladies lent grace and charm to the occasion.

Owing to the fact that experts in anesthesia are scarce in Chicago, and some of these were in service, the Clinics were not as numerous as might have been desired, but

those that were held by Drs. Herb. Atkeisson, Morgan and others were interesting and profitable.

In conformity with the custom of meeting annually just previous to the A. M. A. sessions, the American Association of Anesthetists will hold its Seventh Annual Meeting in Atlantic City in June, 1919. The Secretary would like to get in touch with those who would care to present papers or original researches.

F. H. McMECHAN, M.D., *Secretary*,
Avon Lake, Ohio.

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October 1918

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CAUSES OF FAILURE AND UNTOWARD RESULTS IN CONDUCTIVE ANESTHESIA.*

RICHARD H. RIETHMÜLLER, PH.D., D.D.S.

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NEW YORK CITY.

(Concluded.)

Another source of pain during the insertion of the needle, which, it goes without saying, must be kept sharp, is scraping along the periosteum, which is extremely disagreeable to the patient. Picking up of the periosteum by the needle point which is extremely painful is avoided in the novocain safety needle illustrated in Figure 2 by the mark placed on the hexagonal hub in such a way that the operator is always able to determine whether the bevel of the needle, which gracefully slides over the periosteum without engaging it, is in the proper position, that is, the bevel of the needle pointing toward the bone, no matter how deeply the needle may be inserted in the tissues. Forcing the needle through muscular tissue causes a dull, yet pronounced enough pain. The infringement upon a nerve trunk is expressed by a very sharp, sudden and intense pain resembling the application of a cautery. As soon as any of these painful sensations arise, indicating that the needle is traveling on a wrong course, a slight withdrawal and subsequent alteration of the direction will immediately overcome resistance and start the needle on its painless way through areolar tissue, which causes the sensation of an advance into butter, while bone offers rigid, muscle and nerve tissue an elastic rubber-like resistance. The needle always must be manipulated during insertion in the manner of a slender probe enabling the operator's delicate sense of touch to determine at any stage what kind of tissue the needle is engaging. Operators who have for years practiced infiltration anesthesia exclusively are often in the habit of causing undue amount of pressure and jabbing, which is extremely disagreeable to the patient and dangerous.

INFILTRATION

While on the subject of infiltration, it should once more be pointed out that this method is superannuated. The undue pressure required in infiltration is liable to produce tissue lesions; the result in the lower jaw is disappointing; each tooth requires individual infiltration, opening up possible passages for infection; the periosteum may be ripped from the bone resulting in intense afterpain and possible necrosis; and most important of all the contents of a focus of infection hidden in the cancellated bone may be forced into deeper strata and the circulation and, revived by the ideal culture medium of Ringer solution, may act in the manner of an active bacterin leading to grave local and constitutional symptoms such as necrosis, osteomyelitis, cardiac disturbances, nausea, malaise and syncope. These risks are usually not present in infiltration on the palatine surface, where it is only necessary to infiltrate the soft tissues under pressure no greater than that required to keep the solution in contact with the tissues.

INFECTED AREAS

Areas which are not *bona fide* healthy are not suitable for injection. If a foramen can be reached by the extra-oral method, this method may be of great value if the patient will give his consent. As a rule, however, patients are laboring under the false impression generously fostered by the medical profession, that the interior of the mouth and its contents are the dentist's exclusive realm. All general infections of the mouth are an absolute contra-indication to intra-oral injections. Pus carried by the needle to great depth may set up violent local and systemic intoxications and even prove fatal. Several such cases are on record.

FAULTY METHODS OF OPERATION.

Before proceeding to operate, the actual establishment of perfect anesthesia must be ascertained by pressure, or pricking or, if indicated, lancing with a suitable instrument within the area to be operated upon. If the slightest doubt exists as to the profundity of the anesthesia, comparison with corresponding non-anesthetized areas will give valuable indications. All anastomosing branches must be carefully considered, else the scalpel, curette, or bone forceps may suddenly invade an area in which sensibility persists. In mandibular injection the long buccal nerve, and in lower anterior teeth the anastomosis from the opposite side must be considered and, if necessary, abolished by an injection in the region of the molars or at the mental foramen of the opposite side respectively. The pain incident to prolonged retracting and stretching of the lips and muscles is combated by superficial injection under the mucous membrane of the cheek in the first molar region. In upper anterior teeth the anastomosis from the opposite side is abolished by a

* Read before the Joint Meeting of the Interstate Association of Anesthetists and the Mississippi Valley Medical Associaton, Toledo, O., October 9-11, 1917; and also before the Annual Meeting of the Ohio State Dental Society, Cleveland, O., December 4-6, 1917.

transverse injection parallel to the masticating surfaces of the teeth half way between the gum-line and reflection of mucosa. The nasal branches are successfully anesthetized by the insertion of a small tampon saturated with 30 per cent. novocain solution upon the floor of the posterior nares. Neglect of these precautions may spoil the most beautiful surgical operation.

In the preparation of abutments or in the excavation of carious dentin the fact is often overlooked that the tooth, though anesthetized, is vital. Overheating or too close encroachment upon the pulp-chamber will lead to painful results and irreparable damage to the pulp. Oral surgeons, who have been used to operating under general anesthesia, had better re-learn how to operate. Speed is absolutely no virtue under conductive anesthesia, the duration of which for from one to three hours is absolutely insured and permits of slow, deliberate and beautiful operations. The manner in which the writer has seen some operators apply their forceps to a tooth or root is enough to frighten the patient forever, and the traumatism caused by speed fiends is not prone to inspire the patient's confidence in conductive anesthesia.

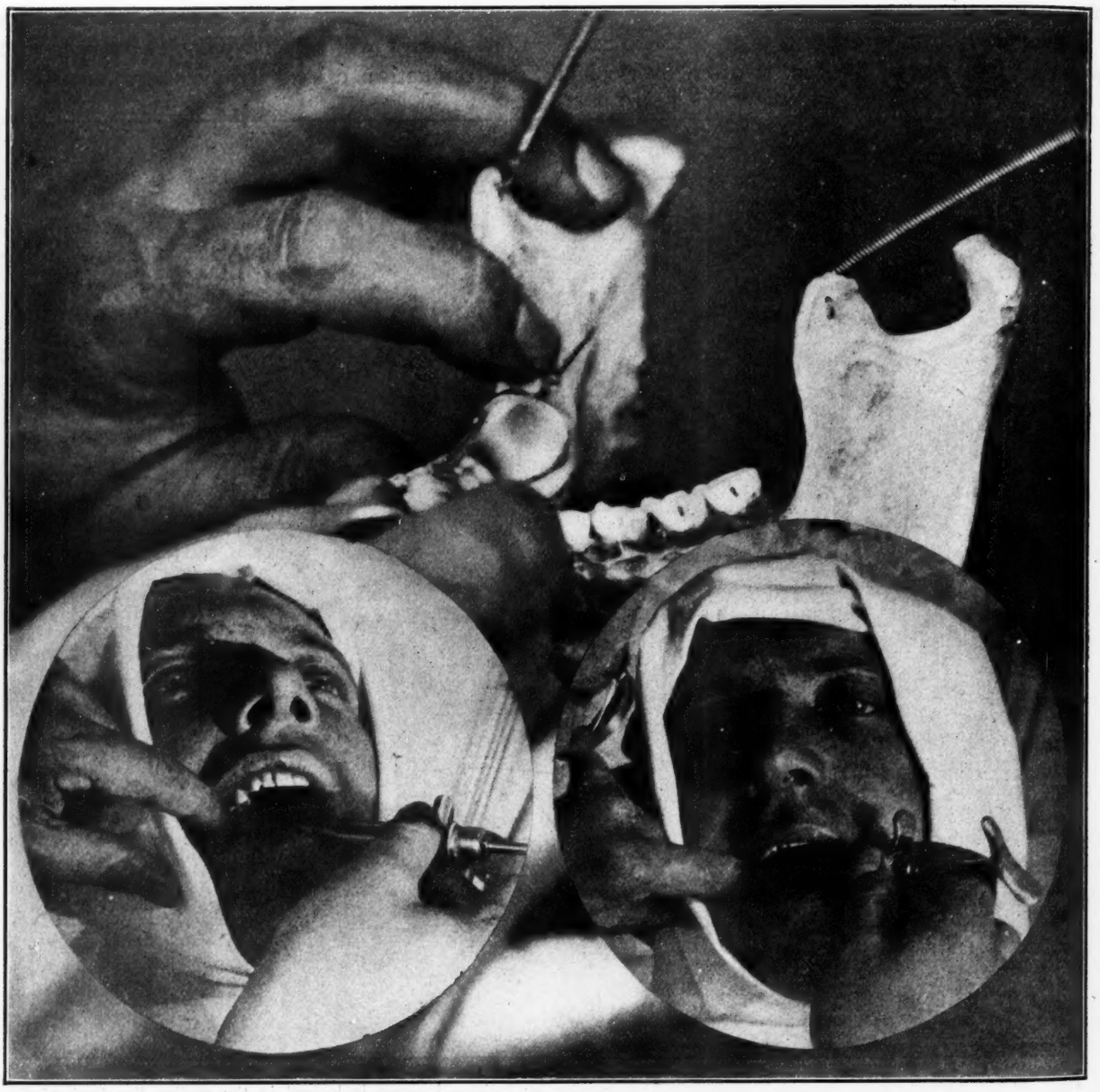
OTHER UNTOWARD RESULTS.

A certain amount of afterpain in many operations always will be unavoidable, as it is due to the traumatism caused by the operation itself and from which the tissues have to recover. Proper after-care, however, will successfully overcome this drawback. After thorough iodizing, wounds are dressed with novocain, anesthesin or orthoform powder in substance and tamponed lightly with iodoform gauze. If the edges of the wound are approximated by sutures, tamponing is out of the question, but the application of novocain in powder in bulk upon the fundus of the wound will en-

Figs. 14-15. Left Anterior Palatine Injection. The anterior or incisive foramen is located in the median line back of the incisive papilla and emits the naso-palantine nerve, innervating the soft tissues palatally from canine to canine. The needle is inserted a short distance anteriorily to the incisive papilla, injecting under light pressure, advancing cautiously and slowly to a short distance posteriorily. Patient's head in reclining posture; mouth wide open. Quantity of solution 0.25 cc. or ⅛ contents of syringe.

tirely prevent or greatly minimize postoperative pains. The frequent renewal of dressings is essential and, if the traumatic pain, despite all these measures, should be unbearable, the patient may be carried over the critical stage by injections of 1 per cent. novocain solutions, conductively. The result-

compress protected by a superimposed piece of flannel is employed to reduce inflammation. Violet ray high frequency current also is very soothing and stimulates healing. Internally pyramidon in 5 grain doses is administered to insure relief and a good night's rest.



Figs. 16-17-18. Right Mandibular Injection. The mandibular foramen is located in the internal surface of the ascending ramus, giving entrance to the mandibular nerve into the mandibular canal, innervating the soft tissues facially, the bone and pulps of all teeth from the third molar to the central incisor. Owing to anastomosis, if thorough obtunding of first bicuspid to central incisor is desired, the mandibular or mental injection of the opposite side must supplement. The external oblique line is palpated in the mouth and the tip of the index finger held in the retromolar triangle. The needle is inserted at the mid-level of the nail of the palpating finger above the masticating surface of molars; in children and in old age somewhat lower, the barrel of the syringe resting on the bicuspid of the opposite side. The needle is advanced to full length before injecting. If the lingual nerve, innervating the soft tissues lingually is to be obtunded, 0.5 cc. or ¼ contents of syringe is discharged when the needle has entered the soft tissues halfway. When injecting on the right side the operator stands in front of the patient; when injecting on the left side, the operator stands on the right side, his arm placed around the patient's head, the left index finger palpating the retromolar triangle; or the injection may be made with the left hand, the nack of doing which is readily acquired and, offers easier access to and better visibility of the oral cavity. In either case the patient is seated erect, mouth wide open. Quantity of solution used 2 cc. or one full syringe.

ing anesthesia greatly heightens the comfort and speed of the healing process. As accessory treatment, ice-bags are applied for from ten to fifteen minutes, or the time-honored Prisnitz cold-water

All other untoward painful results except those just mentioned are best overcome by prevention. Periostitis is avoided by avoiding injury of the periosteum. Pain or impaired function in muscle tis-

sue is caused by perforation of this tissue and deposition of solution within this tissue which acts much in the manner of a foreign body, the absorption of liquids within muscle tissue being extremely slow owing to its poor vascularity. Absorption is hastened by massage and electric stimulation. Edema measures tending to stimulate absorption by heat and massage. Sometime an abnormal discoloration of the face is noted following infraorbital and tuberosity injections, especially in patients with flabby tissues. The face over the region injected becomes entirely white, color returning after a few minutes.

Figs. 19-20. Left Mental Foramen Injection. The mental foramen is located beneath and between the roots of the first and second bicuspids, where the incisor branch of the mandibular nerve, innervating the bone and pulps of the first bicuspid (sometimes), canine and incisors, also the mental branch, innervating the skin of the chin, skin and mucous membrane of the lower lip, and anastomosing branches of the other side are blocked. Palpate foramen on face with the tip of the index finger, depressing lip with thumb. The needle is inserted in the reflection of the mucous membrane between the two bicuspids and advanced, while injecting, almost vertically downward; since the foramen opens distally, until the discharging fluid is felt under palpating fingertip. Operator stands behind patient, who is erect, mouth half-open. Quantity of solution used 1 cc. or ½ syringeful.

is due to overly rapid injections and, if present, should be immediately distributed by gentle massage. Piercing of a blood vessel following unduly rapid advancement of the needle brings about the extravasation of blood into the connective tissues. The resulting clinical symptoms are those of a bruise or black eye with tenderness and the gradual rainbow discoloration of the effused blood. The treatment is the same as that of black eye, all therapeutic This rather unsightly symptom is no doubt due to the action of the suprarenin upon the veins or the direct introduction into a small vein. Gentle massage will hasten the return of color. Emphysema is due to the introduction of air-bubbles left in the syringe, and, while involving no danger, is extremely alarming to the patient and disfiguring. The patient's face is puffed and attempts at aspiration of the air embolus are usually futile, as the embolus

changes its position as soon as pressure is brought to bear upon it. Again stimulation of absorption is indicated as a therapeutic measure.

Unduly prolonged anesthesia follows either the accidental injection of alcohol, if the antiseptic solution has not been properly washed from the syringe, or the perforation of the neural sheath. Such surgical injury of a nerve is again best avoided by extreme caution in the insertion of the needle as has been pointed out above. Several cases of anesthesia lasting for weeks and months that have come to the writer's notice, have been due exclusively to a severance of a nerve trunk in the course of an operation, hence cannot be attributed to conductive anesthesia.

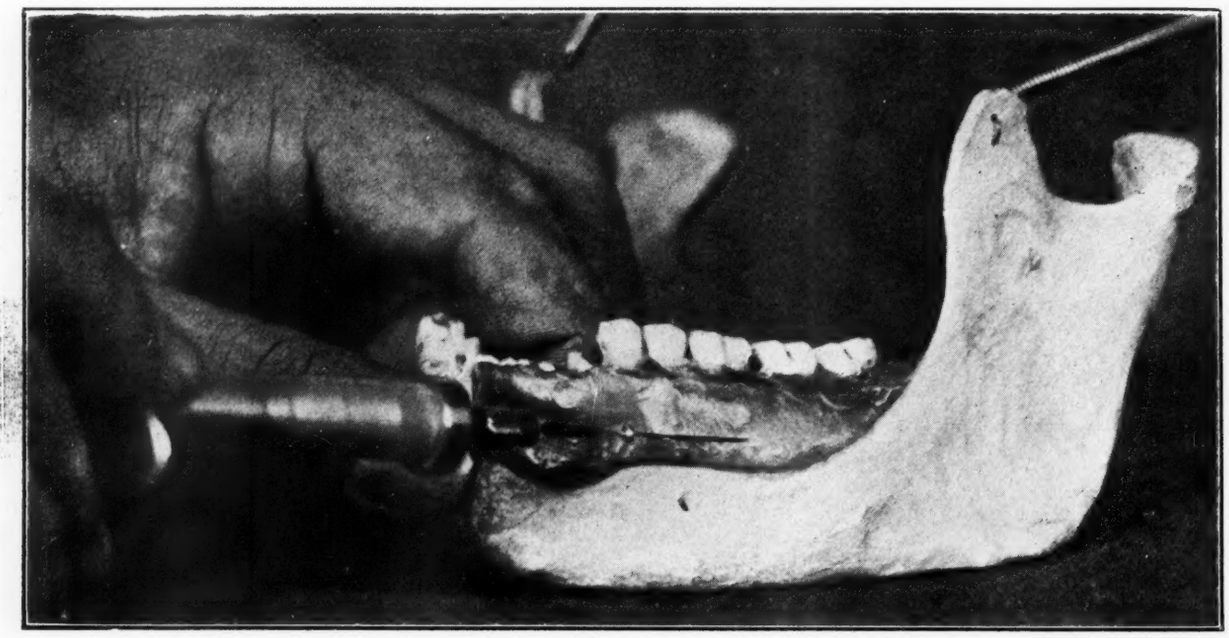


Fig. 21. Long Buccal Nerve Injection. The buccinator nerve, supplying the buccal mucosa of molars and bicuspids and angle of mouth with sensory fibers is blocked as follows: the needle is inserted in the second bicuspid region, half-way between the cervical margin and the reflection of the mucous membrane and is advanced parallel with the masticating surfaces of the molars, while continually injecting on the bony service. Injection in the cheek, opposite the second bicuspid, is indicated if prolonged operation is to be made to avoid pain in the buccinator muscle from holding mouth open a long time. Operator stands in front of patient, who is seated erect, mouth half open. Quantity of solution 1 cc. or ½ syringeful.

Hysterical spasms following several hours after novocain injections can be explained only by pre-existing nervous disease which could have been induced by any other irritation of the nervous system, therefore they cannot be directly attributed to novocain.

Erotic symptoms belong to the same class of neurotic disturbances. They are observed far more frequently under general anesthesia, but may be elicited in highly sexed patients merely by the presence or close contact of the operator. Their casual occurrence merely tends to accentuate the necessity of the presence of a third person at any operation, no matter how slight, but especially when anesthetics are given. Erotic hallucinations in hysterics may occur upon seemingly trifling irritation, and it is the operator's duty to guard his patient as well as himself against medico-legal complications.

CONCLUSION.

When we consider the thousands of injections of novocain-suprarenin being made in every large community every day without any untoward results whatever, the remarkable safety of this method of anesthesia is patent. Surely few operators would be willing or able to do without conductive anesthesia in their practices today, after they have once come to realize fully its incomparable advantages over older methods. A knowledge of the causes, however, of possible untoward results which may arise seems most desirable, and it is to be hoped that the teaching and practice of this method will be left to the fully competent, else dentistry may again, as it has happened with other methods before, be cheated out of the blessings of a doctrine which has proven itself to be a boon to humanity.

311 GROVE ST., MONTCLAIR, N. J.

THIS IS THE ONE TIME IN YOUR LIFE WHEN YOU HAVE THE OPPORTUNITY OF DOING YOUR BIT AND YOUR BEST FOR YOUR COUNTRY AND YOU SHOULD BE PROUD AND WILLING TO EMBRACE THE CHANCE. YOU ARE NEEDED TO GIVE THE WOUNDED DOUGHBOYS A BETTER CHANCE FOR RECOVERY.

THE ANESTHETIST'S DAY'S WORK.*

ALBERT H. MILLER, M. D.,
Acting-President American Association of Anesthetists.
PROVIDENCE, R. I.,

Surgical anesthesia is too frequently thought of as an absolute condition maintained by dropping ether regularly on a square of gauze or by manipulating the valves of a complicated apparatus.

The anesthetist's day's work is no such simple matter. It comprises the physical examination of the patient, a prognosis as to the chance for uncomplicated recovery, choice of the anesthetic best suited to the case, administration of the chosen agent according to the best technic, and noting the after-effect of the anesthetic until the dangers from postoperative complications have passed. Under present conditions the anesthetist must also find time for investigation and study.

THE ANESTHETIST'S TEXT-BOOK.

The composition and physical properties of the atmosphere, the principles govering vaporization, and the law of partial pressure of vapors and gases are included in the introduction to his text-book. Chapters follow on the mechanism of respiration, the respiratory changes in the air, the respiratory changes in the blood, the mechanism of the circulation, the effect of hemorrhage, of shock and of anesthetic drugs upon the respiratory and circulatory mechanism, the physical and chemical properties of the various anesthetics, and their physiological effect upon the normal or the diseased organism.

EXAMINATION.

The physical examination is made by the anesthetist himself, or under his direction, and preferably on a day preceding that of the operation. The subjective examination includes the questions of age, previous anesthesia, and symptoms of organic disease, especially cardiac, pulmonary or renal. The objective examination covers the heart, the lungs, the urine, in some cases the blood, and, of greatest importance, an estimation of the blood pressure. Information as to the nature and the probable duration of the operation is also required.

PROGNOSIS.

In deciding upon the chance for uncomplicated recovery, the factors to be considered are the age, the organic condition, the resistance,—as shown by the blood pressure index,—and the nature of the operation. Considering these factors, the anesthetist places each case in one of the following classes:

1. Good risk. Certain recovery.
2. Fair risk. Probable recovery.
3. Bad risk. Doubtful recovery.

He enters the prognosis in his record and, when it is unfavorable, notes the reason for this opinion. Evidently, with few exceptions, general anesthetics may be used for minor operations only among patients of class 1, and only for urgently necessary operations will they be administered to patients of class 3. Among the patients of class 2 some lives may be saved by careful attention to the preparation. The operation must sometimes be deferred for this purpose. Whether the prognosis is favorable or not, the anesthetist bends all his energy to securing one result—an uncomplicated recovery.

CHOICE OF ANESTHETIC.

Until the ideal anesthetic shall have been discovered, the choice will lie among the following agents: ether, given by one of several methods, nitrous oxid-oxygen, chloroform, and local anesthetic agents. The choice of the anesthetic depends, to some extent, upon the anesthetist's practice. If he is more skilled in the use of ether, this agent will be safer in the majority of cases. If he is accustomed to use nitrous oxid-oxygen, that anesthetic should more frequently be chosen. The nitrous oxid-oxygen enthusiast will find some cases for which ether is the safer anesthetic and the ether devotee will encounter instances where nitrous oxid-oxygen is the anesthetic of choice. Each will occasionally find that an intimate acquaintance with chloroform is indispensable to the most satisfactory work. *The anesthetist who is familiar with only one anesthetic agent must fail in some instances where another will succeed.*

ADMINISTRATION.

During the administration, the anesthetist has but three duties to perform:

1. To administer the anesthetic in the minimum amount required for the successful performance of the operation.
2. To maintain a free air way.
3. To note the condition of the patient.

MEASURED METHODS.

Continued scientific study of anesthesia will indicate that measured methods of administration must be generally adopted. As in the case of other potent drugs, the dosage of anesthetic agents may be stated within narrow limits. It is at least as important to know the usual dosage of the anesthetics as it is to know the customary dosage of strychnin or of morphin. To one who is familiar with a measured method of anesthesia, a change to an unmeasured method would mean a distinct de-

*Acting President's Address: Read during the Sixth Annual Meeting of the American Association of Anesthetists, Auditorium Hotel, Chicago, Ill., June 10-11, 1918.

terioration in the character of his work and a halt in the progressive improvement in technic which is characteristic of measured methods. The theoretical and practical advantages of the measured methods are so evident that it is difficult for one to understand how any anesthetist delays in adopting them.

The dosage of ether may be expressed in liquid measure or in terms of vapor strength. In measuring liquid ether, it is important to remember that the specific gravity of the liquid is .716 and that a half-pound can contains 11.17 fluid ounces. The minimum anesthetic dosage of ether, learned from the study of intravenous and colonic etherization, is about 2 ounces for the first hour, including the amount used for the induction. To neglect to include the latter amount when stating the dosage is, whether intentionally or not, certainly misleading.

In expressing the dosage of ether vapor, much misconception has resulted from lack of standardization of terms. The dosage has been noted as vapor tension, weight percentage, or volume percentage. So much confusion has followed the indiscriminate use of these three methods of expression that some otherwise excellent papers have, as a result, been rendered useless. Expressing ether dosage in terms of partial pressure or vapor tension is of the greatest value in technical discussion and computation. Practically, the method is faulty as there is no direct means for measuring vapor tension and the expression of dosage in terms of vapor tension is unlikely to result in a clear mental picture. If we represent vapor strength in percentage by weight, we must constantly consider the specific gravity of ether vapor and also of air and the result is not readily visualized. A representation of vapor strength by volume percentage gives a clear mental picture and is the method of choice.

While ether or chloroform vapor for anesthetic purposes is never used pure, but always in mixture with a large proportion of air, nitrous oxid-oxygen must be used in the pure condition unmixed with air. The dosage of nitrous oxid-oxygen is indicated in terms of volume percentage of the two gases or in terms of rate of flow of each gas per period of time.

The dosage of local anesthetic agents should be stated in weight of the drug employed as well as in volume per cent.

FREE AIR WAY.

A free air way is of great importance in every form of an anesthesia. With ether or chloroform, cyanosis is never allowable. The amount of the anesthetic necessary to produce anesthesia does not displace sufficient oxygen to result in cyanosis, and mechanical interference with respiration must always be discovered and relieved. The anesthetist must seek the cause, not only within the upper respiratory tract, but externally as well, as in the case of a tight bandage about the neck or an assistant resting on the chest of the patient. None of the inhalation anesthetics when well administered, in case the mucous membrane is healthy, produces any marked increase in the secretion of mucus. The excess of mucus seen in some cases of etherization is due simply to a great overdosage of the drug.

CONDITION OF PATIENT.

For noting the condition of the patient during operation, the sphygmograph is by far the most valuable means at our disposal. With routine 10-minute blood pressure tests intelligently interpreted, the anesthetist is in a position to appreciate the effects of hemorrhage or of shock and to predict with considerable exactness the space of time during which the operation may safely continue.

The anesthetist starts the administration sufficiently early to insure the necessary relaxation at the beginning of the operation, but not so soon as to subject the patient to an unnecessary duration of anesthesia. He notes the steps of the operation only as a guide for his own work. Seated on a low stool, with his work before him, the field of operation is not in his range and he is out of the line of vision of the operator. His duties and his presence may be forgotten by the surgeon except in case of emergency. As the operation nears its end, he lowers the anesthetic dosage so that recovery may commence as soon as possible after the operation is finished. If these conditions are not present, the situation is not greatly improved by placing a screen to hide the anesthetist from the surgeon and the surgeon from the anesthetist.

RECOVERY.

The test of good anesthesia is satisfactory recovery. Having labored assiduously to secure uncomplicated convalescence the anesthetist will certainly be sufficiently interested to follow the after-condition of the patient. In the consideration of postoperative complications and fatalities, the preoperative prognosis becomes of great value. In some cases, conditions entirely independent of the anesthesia will be encountered in the course of the operation which will necessitate a revision of the prognosis, but, in general, a death occurring among the cases in which the anesthetist has given a favor-

able prognosis should be completely investigated, to determine the influence of the anesthetic in producing the fatality. A series of deaths or of postoperative complications calls for a very thorough investigation. Misleading reports, comprising large series of cases where no death was immediately due to the anesthetic, but with many instances where investigation would have shown that the anesthetic had been a factor contributing to death or serious complications, should not pass unchallenged. Our tendency to forget our present failures must be overcome if we are to hope for greater success in the future.

A large proportion of nausea and vomiting following operation is due to overdosing with the anesthetic and disappears when a carefully measured dosage is adopted. Following a well administered ether anesthesia, 60 per cent of the patients will have no nausea or vomiting at any time. About 40 per cent vomit slightly, once or twice within an hour or two of the operation. Less than 1 per cent vomit to excess in a period varying from several hours to several days. Care is required in determining the proportion of nausea and vomiting following anesthesia. The advocates of each new method claim a reduction in nausea as one of its advantages. If all of these claims had been justified, at the present time all of the patients would recover from the anesthetic not only without nausea but with a prodigious appetite.

One may object that it is a lot of work to examine patients on the day before operation, to study measured methods, and to follow the after-conditions of the patients. Why need the anesthetist take so much extra trouble? The advantages gained are well worth the effort. The patients will have a more comfortable surgical experience and a better chance for uncomplicated recovery. Also, the anesthetist himself, who does better work today, can look forward to further improvement in the future.

I cannot close this address without consideration of our special duty today. Anesthetists are highly specialized, skilled in their own work, but frequently lacking in experience in general medicine and surgery. How may the members of this association, who are not already in service, best serve our country and the cause of freedom? The answer is clear. Those who are eligible should enlist in the Medical Reserve Corps. In this organization are great opportunities for service in every branch of medical work. Those who are ineligible, through age, physical disability, essential institutional or public work, or on account of their dependents, for service in the Medical Reserve Corps, should enlist in the Volunteer Medical Service Corps. The service of the members of this corps will be rendered to existing governmental agencies upon the request of the Army, Navy, Public Health Service and American Red Cross, to fill certain needs not already covered, and such other service as may be determined by the Central Governing Board of the Volunteer Medical Service Corps.

In the present emergency, the anesthetist should seek for opportunities for improving his own day's work, for standardizing the methods of anesthesia, for giving instruction in medical schools, for improving anesthetic conditions in the civilian hospitals and for instructing those who are to administer anesthetics in the Army and Navy hospitals and at the front.

131 WATERMAN STREET.

INSTRUCTION IN THE PHARMACOLOGY OF ANESTHETICS.*

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Before the student is given the opportunity to acquire a practical experience in the administration of anesthetics to human patients, he should possess a rather thorough knowledge of their actions; that is, of their pharmacology.

This does not mean a mere memorization of ill-digested textbook details: but rather a personal grasp of the essentials of the subject. There is but one way of obtaining such a knowledge of any subject; namely, to take it apart and fit it together, to turn it inside out and outside in, until the mind can grasp it in every part and as a whole. This represents an ideal that cannot be realized in full even by the specialist; but it can be approached even by the student, under proper conditions.

It is important to this end that the student should have the opportunty to study the subject from several points of view, for this is essential to true perspective; and that he should have the opportunity to apprehend the subject with his senses, for this is essential to render it alive and personal.

Such a study involves the taking apart, the analysis of the actions of the anesthetics; their modifications by asphyxia, hemorrhage and sensory reflexes; the phenomena of fatalities; the possibilities of treatment. All these are matters that can be presented to the senses only by personal experi-

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mentation, by practical work in the laboratory, involving the use of animals, and employing the ordinary methods and apparatus of pharmacologic experimentation.

The subjects can therefore be studied to the best advantage in the course of Experimental Pharmacology, or Pharmacodynamics. Indeed, a fairly thorough study of the subject of anesthetics is a necessary part of pharmacologic instruction. It would result in a considerable waste of time and effort to overlook these facts, and to plan a special course on anesthetics without reference to the instruction that a student should have obtained in Pharmacology.

Useful repetition of instruction must be purposive, and not haphazard. There is a very real need of a better correlation of instruction.

The details of the instruction should vary in different institutions, so as to utilize special qualifications and resources, and to encourage initiative. It is only essential that the principles be followed: that the instruction in Pharmacology should have the responsibility of giving the student a thorough knowledge of the fundamentals of anesthesia; and that the instruction in clinical anesthesia should be built on this basis. There should be a certain amount of dove-tailing. The instruction in Pharmacology should be planned with a view of its future practical application, and should therefore at least outline the problems of clinical anesthesia. The instruction in clinical anesthesia should involve the constant use, and therefore review, of the fundamental data.

The instruction in anesthetics, as it has been developed in the course of Pharmacology at Western Reserve, may serve as an illustration of these principles,—it being understood that it is merely an illustration, and not a fixed pattern.

It should be explained that this course is divided into two parts: The objective study in the laboratory is given in the latter part of the second medical years. In this introductory course, the subject is arranged according to the tissues and functions that may be affected by drugs. The work is, as far as possible objective, and as little as possible didactic. Nearly the entire instruction consists in demonstrations and individual laboratory work, with sufficient conferences to insure the understanding of the facts.

The work in the first half of the third medical year is entirely didactic, and takes up the individual drugs systematically. It is based on the laboratory work of the preceding course, but aims to be more systematic and more detailed, and to apply the pharmacologic data to the problems of the clinic. It is along the usual lines of didactic instruction and scarcely needs further discussion.

The arrangement of the laboratory course, as already explained is not such as to take up anesthetics, once for all, and then drop them. On the contrary, they are studied on frequent occasions, and from different points of view, so that they are kept before the student almost continuously.

The course begins with CHEMICAL AND PHYSICAL WORK. This offers opportunity for presenting the basic theories of anesthesia, in connection with the study of Distribution of Coefficient, Competition of Solvents, etc. It also includes the changes that occur during the Evaporation of Anesthetic Mixtures.

The next line of investigation involving anesthetics occurs in connection with the general conception of depressants. This presents the SYMPTOMS OF NARCOSIS, as exhibited by frogs; including the comparison of various central anesthetics. These experiments prepare the student for the later experiments on mammals. They also permit observations on the reflex time; and the demonstration of the independence of narcosis from circulatory changes (by the "salted frog").

We then come to LOCAL ANESTHETICS, illustrating depression of localized nervous structures. The effects of various local anesthetics are studied and compared, on direct application to nerve-trunks, and on mucous membranes (frog's foot, rabbit's cornea, human tongue). Infiltration anesthesia may be demonstrated by the wheal-method. This also shows the influence of epinephrin. The ethyl chlorid spray is applied by the students.

It must be understood, in this as in all other experiments, that the individual students do not perform all the experiments. These are distributed among the class, so that each student covers the essential phenomena. The special features of the experiments are brought out in the semi-weekly CONFERENCES, where all the results of the class are presented and discussed.

The course next takes up various functions that are affected incidentally by anesthetics. This includes the direct effects of chloral on VESSELS (Perfusion of excised kidney, spleen, or intestine); and particularly the effects of the various anesthetics on the HEART; the relative toxicity as illustrated on the frog-heart; and the analysis of the cardiac effects by tracings from the intact and from the perfused hearts of frogs and turtles; the antagonism of epinephrin, etc. Here again the different students work with different methods or with different anesthetics, and the results are compared in the conferences.

The study of anesthetics is resumed on NORMAL, INTACT MAMMALS; observing the symptoms and toxicity, and their modifications by antagonists. This includes also the relative absorbability by stomach and rectum (chloral); effects on temperature (chloral, morphin, cocain); glycosuria (morphin); treatment of narcotic poisoning by caffein, strychnin and heat; Magnesium anesthesia and calcium antagonism; trigeminal-vagus reflex of chloroform inhalation, etc.

A later exercise takes up the changes of RESPIRATION as effected by anesthetics; determinations of the respiratory volume and respiratory tracings, as modified by chloral, alcohol and morphin under various conditions; and their response to reflex irritation, camphor, caffein, etc.

This preliminary work has prepared the class for an intensive study of the anesthetics as such, with special reference to the problems of clinical anesthesia. In this exercise, some of the group compare the onset, course and duration of anesthesia with different agents (nitrous oxid, chloroform, ether, ethyl chlorid, rectal ether) and the modifications introduced by the use of morphin or morphin-scopolamin.

Other groups take tracings of the respiration, and blood-pressure, under varying conditions,—such as simple, smooth ether or chloroform anesthesia, light and deep; effects of reflexes during different degrees of anesthesia; insufficient aeration; change from one anesthetic to another; also intravenous and insufflation ether anesthesia.

Anesthetic accidents occur naturally or are induced intentionally; such as simple excess of anesthetic; asphyxia; myocardial insufficiency (by phenol); cardiac dilatation (saline infusion), and cardiac failure (epinephrin). The various methods of resuscitation are applied and compared. The students are encouraged to vary the experiments so as to bring out as many phases of the anesthetic problem as possible.

Later experiments take up the effects on the mammalan circulation by more specialized methods, such as the vasomotor center by the perfusion-plan and cardioplethysmographic tracings.

DISCUSSION.

DR. E. M. SANDERS, Nashville, Tenn.:—Dr. Sollman's paper is of exceptional interest to all those who are teaching anesthesia, either in the laboratory or the clinic and I trust that we will all carry away with us many of the practical points he has made. Even a cursory review of the literature of anesthesia in recent years shows a surprising amount of attention being paid the subject by research-workers, while there has been a commendable disposition on the part of expert anesthetists to turn all valuable investigations to practical purposes. It should, however, be emphasized that the teaching of anesthesia, both in its pharmaco-physio-pathological and clinical aspects admits of great extension and improvement.

DR. BEN MORGAN, Chicago, Ill:—I can only reiterate Dr. Sander's remark on the poor showing we are still making in the teaching of anesthesia. While Dr. Sollman's schedule represents the basic principles with which each student should become familiar, it should also be pointed out that the student should not be misled by the effects on anesthetics on healthy animals, which may be considerably at variance with the effects on patients in a critical condition submitting to gruelling operations. The problem is how to blend laboratory and clinical instruction so that the experimental work enhances clinical progress. It is my impression that this association could accomplish a good deal through the work of a special committee appointed to draft a course of basic laboratory and clinical instruction and attempt to have it adopted by the various medical schools as a standardized course in anesthesia.

DR. ISABELLA C. HERB, Chicago, Ill.:—There is no doubt that certain clinics and schools have the aptitude of putting their medical students and internes to the solution of vexed problems in anesthesia. I know that at Rush and in the Presbyterian Hospital we have had very encouraging results from the experimental and clinical work of the students, but we have always tried to direct this work of investigation along practical as well as scientific lines. Students and internes need only be impressed with the fact that anesthesia holds out opportunities to them to be interested in achieving efficiency both in its experimental and clinical phases. Schools or clinics that attach no importance to anesthesia should not expect any interest in the subject from their students or internes. The best incentive is to provide something to be striven for and attained.

DR. F. H. MCMECHAN, Avon Lake, Ohio:—It is certainly a very peculiar situation in medcal education to find some notable institutions in which excellent research-work in anesthesia is being done still using non-medical persons for the administration of anesthesia to patients. While non-medical persons may be made proficient in some one, routine method of surgical anesthesia, they lack the fundamental education and training to comprehend the advances in anesthesia and to apply them for the benefit of the public. These medical schools, also, are doing themselves and their students an injustice in that they are virtually closing the doors to a career in anesthesia to their students. The literature on anesthesia of the past fifteen years contains some three or five contributions from non-medical anesthesists. If progess in anesthesia were dependent on this source of research and clinical advancement, anesthesia would have long since died of dry rot. It is a good sign of the times, however, when the research-workers of the most noted medical schools not only interest themselves in anesthetic investigations, but extend our association the honor of coming before it and presenting their data and results.

THE SPECIALTY OF ANESTHESIA IS BEGINNING TO COME INTO ITS OWN. A NUMBER OF ASSOCIATIONS OF ANESTHETISTS HAVE BEEN ORGANIZED; AN OFFICIAL ORGAN HAS BEEN ESTABLISHED FOR THE PUBLICATION OF THEIR TRANSACTIONS AND A YEAR-BOOK HAS BEEN FOUNDED TO COLLATE AND PRESERVE ALL WORTH-WHILE RESEARCHES AND CLINICAL PROGRESS IN PERMANENT FORM. THE QUESTION NOW IS WHAT ARE YOU DOING TO MAKE THESE VITAL ADJUNCTS OF YOUR SPECIALTY A SUCCESS? ARE YOU BRINGING NEW MEMBERS INTO YOUR ASSOCIATIONS OF ANESTHETISTS? ARE YOU PREPARING PAPERS FOR THEIR PROGRAWS? ARE YOU PURSUING ANY RESEARCHES IN THE SCIENCE OR ART OF ANESTHESIA? IF NOT WHY NOT? YOUR SPECIALTY NEEDS YOUR CO-OPERATION.

ANESTHESIA AT THE FRONT

Continuing the Department of Anesthesia at the Front. the Editor of the SUPPLEMENT presents additional data collated from authoritative sources that will be of interest to those making a study of Anesthesia in War Surgery.

EXPERIENCES OF AN ANESTHETIST AT THE FRONT.*

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In the autumn of 1914, the Governors of McGill University, Montreal, offered the Canadian Government a sufficient number of the staff of its Medical Faculty to provide officers for a military general hospital. On the 5th of March, 1915, the hospital, which was known as No. 3 General, commenced recruiting. The Commanding Officer was Colonel H. S. Birkett, dean of the Faculty of Medicine, who had served for many years in the Canadian Militia before the War. Among the officers were specialists in surgery, internal medicine, diseases of the eye, ear, nose and throat, an anesthetist and a neurologist.

We had among the noncommissioned officers and privates seventeen men who were given their degrees in medicine that Spring. We had also a number of medical students. I may say now that shortly after our arrival in England the graduates were taken from us and given commissions in the Royal Army Medical Corps. Later on the medical students of the 4th and 5th years were ordered to return to Canada to complete their medical education. A number of the men in the primary years managed to break away and join combatant units as officers. Two succeeded in getting into the Royal Navy as surgeon probationers. The public in Montreal were much interested in the hospital and subscribed liberally to the company fund.

We were given two motor ambulances and two four-seated Ford cars. The latter were found to be very useful for pleasure as well as business and many were the delightful trips we took in them before the supply of petrol was cut down and such excursions forbidden.

A Canadian lady living in the United States wrote to us saying that she had heard that anesthetics were needed at the front and offered to buy us a supply. It was suggested to her that she should present a gas and oxygen apparatus. Her answer was that she had made inquiries and had been told that this could be bought for about twenty-five dollars and that she would like to give something which would cost more. When it was explained how much the real cost would be she at once sent a cheque for $1,000.000. With this an Ohio Monovalve was bought and a plentiful supply of nitrous oxid and oxygen in both large and small cylinders.

We left Montreal on May 6th and arrived in England after a very uneventful voyage. Shortly after arriving in England most of our officers were sent to different military hospitals for instruction. I was sent with two others to Netley, near Southampton. When we reported for duty there the adjutant said to us with rather a weary air: "Well, gentlemen, I am delighted to see you, but I have no work for you and no quarters. You had better find billets in Southampton." So for three weeks we had nothing to do but amuse ourselves, which we did to some purpose, exploring the New Forest and making trips to London, the Isle of Wight, Salisbury, including Stonhenge, and other places.

We arrived in France on June 18th and after a short train journey were dumped down at a small country station near which were some British tent hospitals. Our camp ground was between two of these. The area assigned for officers' quarters was in a ploughed field and here we were soon at work putting up our tents. It was six weeks before we were ready to receive patients. During that time we were erecting the Indian Durbar tents supplied to us. These are huge marquées, some of them capable of accommodating 60 beds. They are made of cotton in several layers and really consist of one tent inside another. At the same time the operating room was built. This contained space for three tables. During such times as we were busy these were in use simultaneously all day long.

When the gas machine was ready for use it was one of the stock sights for distinguished visitors. Great were their wonder and admiration. As many of you know, the English apparatus for gas and oxygen is of a rather primitive type. So far as I know they have none which will supply a steady flow of gas at a uniform pressure. *We used our apparatus a great deal. It was especially useful in patients who were in very bad condition. Many of these cases were suffering from gas gangrene or other form of severe sepsis. It was also very useful in the wards for painful dressings, especially cases of compound fracture of the femur and gun-*

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shot wounds of the knee. We brought over with us the small carriage made for taking the apparatus about. It had the fault of not being strong enough. The carriage, however, had never been intended for use at night, over rough ground. Something in the nature of a wheelbarrow would have been more serviceable. *My experience with ether made me consider it distinctly less useful than in civil practice. English ether seems to be weaker than American. We, fortunately, brought a supply of Squibbs' ether and found it more satisfactory. A soldier, as a rule, takes a large amount of anesthetic. With open ether, especially in the hands of an inexperienced anesthetist, he is liable to use language which it is extremely unpleasant to hear in the presence of nursing sisters. Closed methods were found much more satisfactory when properly used, especially when commenced with nitrous oxid gas. A very satisfactory way is to precede ether with ethyl chlorid, using Loosely's Inhaler attached to Hewitt's wide-bore inhaler.* There is, of course, the trouble of washing the apparatus after each administration. This unfortunately had to be done often in a hurried and perfunctory manner. The anesthetist has to do this himself as the number of nursing sisters and orderlies in the operating room of a military hospital is strictly limited.

I used intratracheal ether frequently and found it very satisfactory. When I was short of assistants I would sometimes put the patient under ether, introduce the tube and leave the patient while I went on with another case. The pharyngoscope issued by the Government was two inches too long but I had it cut down and then it did very well. I know no instrument as satisfactory as Chevalier Jackson's. *I had a fairly large experience with chloroform and found it on the whole the most satisfactory of all anesthetics. At first I used the Vernon Harcourt inhaler. The initial outlay is rather high as it costs twenty-five dollars but the saving in anesthetic is wonderful. I have frequently anesthetized patients for short operations with less than two drachms of chloroform. The chief defect of this method is its slowness as it takes sometimes eight or ten minutes to get the patient under. Recovery, however, was quick and very few patients afterwards complained of any unpleasant sensations. Vomiting was extremely rare.* One of my assistants became ill with appendicitis and had to be operated on. I asked him what anesthetic he would like and he immediately said: "Chloroform, with the Vernon Harcourt Inhaler." He afterwards spoke in the highest terms of his experience.

Another defect of the Vernon Harcourt Inhaler is that the rubber face piece rots very quickly from the solvent action of the chloroform. The latter impregnates the saliva and where the saliva reaches the face piece rotting soon commences. I also had very satisfactory results with chloroform given on an open mask. I never had a death, though one of my assistants, who had not had much experience in anesthesia, lost a patient. At No. 3 General after I left it there was a death under ether and another under nitrous oxid and oxygen, both apparently due to the anesthetic, but I have no very complete knowledge of the details.

In a certain number of cases I used ethyl chlorid alone for short operations with Loosely's Inhaler. I never found it as satisfactory a method as nitrous oxide and oxygen. It is, however, useful when the latter cannot be obtained and is much more portable.

There are in the Canadian Army Medical Corps in England and France not more than four or five specialists in anesthesia. The anesthetic is frequently given by the most recently joined officer, with results to the patient which it is not necessary in this company to specify. The more one sees of the real soldier the more one feels that nothing is too good for him. To increase his comfort and safety I would like to see private enterprise supply modern gas apparatus to all the Canadian hospitals. This cannot be expected from the Government on account of the expense. A specialist in anesthesia might be detailed to go from hospital to hospital to teach the proper method of using gas and oxygen and to make suggestions as to the organization of a proper anesthetic service in each hospital.

If the younger medical officers were kept on anesthetic duty continuously for three months and their work properly supervised, we would not have so many of the wounded dreading the anesthetic more than the operation.

Every expert anesthetist that this Society sends overseas means the saving of a certain number of soldiers' lives and the prevention of an immense amount of suffering and discomfort.

The bearing of the British soldier in the operating room is admirable. If he is a walking case he comes in his blue hospital suit, kicks off his heavy boots and jumps up on the table without a word. He does exactly what he is told, is wonderfully appreciative of anything that is done for him and is very uncomplaining.

As winter came on our Durbar tents were found to be unserviceable. There was a great deal of rain with high winds. The cotton became soaked and the tents were either blown down or torn. The muddy soil would not hold the tent pegs. Finally

on November 20th, we were notified that we were to close down and admit no more patients. We had then nothing to do but while away the time. This was not very easy to do. The officers' mess was in two marquées heated by braziers which filled the atmosphere with fumes which induced coughing and only warmed those who sat very near them. We slept in bell tents which were comfortable enough when a coal-oil stove was burning, so long as one did not have one's feet on the floor. To leave them there meant they soon became as cold as ice. The best way to be comfortable was to lie one one's bed.

During this time our Commanding Officer received an invitation to send some of his officers to Paris to attend a banquet given by the American Club of Paris. Permission was obtained and eight of us went in our two Ford cars. The journey which took a whole day each way, was very cold and much prolonged by numerous accidents to our tires which were old and worn out. However, it was well worth while as a change from the monotony of camp life. Early in December twelve of our officers, including myself, received orders to return to England for duty at Shorncliffe. Not long afterwards, having applied for a transfer, I was ordered to return to Canada to help in the recruiting and organization of the 9th Field Ambulance. Owing to delay in getting my movement order I arrived in Montreal only four days before the field ambulance left, so that I had two voyages across the Atlantic, both of them very stormy, within a month. On arrival in England about the middle of March, we went into camp at Bramshot. We had a certain amount of discomfort here as the weather was cold and we had to sleep in huts which were not heated or furnished in any way.

A field ambulance in the British Army is composed of three sections, A, B and C, each capable of acting independently. Each section is composed of a tent sub-division for operating and dressing station; a bearer sub-division for collecting wounded and a transport sub-division, the personnel of which is drawn from the Army Service Corps. Its function is to take over the wounded from the fighting units and transport them to some place where they can be taken over by a motor ambulance convoy which in its turn takes them to a Casualty Clearing Station. The total personnel is 10 officers, nine of whom are doctors, and 224 noncommissioned officers and men. There are three horse and seven motor ambulances, besides a good deal of other transport wagons of various kinds.

Our time in Bramshot was taken up pretty fully in completing our equipment, medical examinations, and route marches. Within a month of our arrival in England we embarked at a port in the South of England. Here we were kept at anchor for five tedious days waiting for the English Channel to be cleared of submarines. When we landed in France we went immediately to a rest camp where we spent four days, and then we received orders to entrain in two parties. I was in charge of the second party which consisted of two other officers and 72 men. We had first to march at night five miles over roads paved with cobblestones. On arrival at the station, we found a train of interminable length and were rather dismayed to find how small an amount of space was allotted to us. The men were wearing their full equipment and when they entrained each one had to be helped up to the footboard and then forced through the door by hard shoving. The only place to put their equipment was on the floor and this left no room for the men's feet. In addition to the men and their equipment we had to find room for two days' rations, which were issued to us at the station, and which included an enormous cheese. We had a good deal of difficulty in finding room for them. The cheese was put in the noncommissioned officers' compartment and was found, I believe, very comfortable as a footstool. In spite of the discomforts the men were wonderfully cheerful and were never heard to complain. We rumbled along all night and at about 7 in the morning arrived at a famous city where we spent the day. At night we entrained again and had another uncomfortable night, arriving late in the afternoon at Poperinghe which was at that time 8 or 9 miles from the trenches. We were casually informed on getting off the train that the town had been shelled the day before, and this information with the sight of buildings protected with sandbags made us realize that we were getting near the *real thing*.

The next afternoon I started with a small party of men to take over a collecting station in Ypres. As we approached Ypres we saw more and more of the effects of war, such as shellholes in the ground and in roofs, roofless houses and trees torn in half. Finally we arrived at the *Abomination of Desolation*. The collecting station was in the cellars of a big and much damaged building. I cannot recommend a cellar in early April as an attractive place to use as a residence. Most of the time was spent in reading by a dim lamp in a small damp room, which we tried to heat by means of a stove not much bigger than the lamp. During the day we held occasional sick parades, but the work was usually very light. There was little enough to tempt one to wander about outside in times of idleness. It was a molelike and depressing existence.

Behind our building was a battery which would wake up from time to time and start firing. After a few rounds it would stop and then the Germans would retaliate. We used to hear the German shells passing overhead and exploding behind us. It was not so bad when this occurred during the day, but at night it interfered with our sleep and we liked it still less. On fine days when the light was good for observation a good many shells would drop in to Ypres during the course of the day. Dull rainy days were comparatively peaceful.

We kept a horse ambulance in the courtyard of the building and stabled the horses in one of the rooms. A motor ambulance was kept standing at the end of a long corridor ready to leave at any minute.

In the evening our rations and mail were brought up. A full water cart would arrive and be exchanged for the empty one. One or more motor ambulances arrived to take part in the clearing of wounded, which was always done at night.

As it became dark the horse-ambulance would start off for a rendezvous where it was to receive its load of wounded from the advanced dressing stations. Being a very large and heavy affair it never went faster than a walking pace. We had in addition to the collecting post an advanced dressing station in a dugout a few hundred yards from the front line. This had to be approached through a mile or so of communication trenches. It was a most *unhealthy* neighbourhood. We kept our medical officer here. His turn of duty lasted three or four days. The wounded were collected during the day and were brought down at night in a truck on rails laid in the open. The truck was pushed by stretcher bearers. This duty was dangerous on account of machine gun fire which was turned on from time to time during the night. From the truck the wounded were transferred to the horse ambulance and taken to a point where they could be handed on to the motor ambulances. These quickly whisked them off to the main dressing station which was almost four miles from the firing line. Life for the medical officer there was pleasanter than that nearer the front. The building we occupied had been a convent school and two old Belgian nuns stayed on in it. They spent most of their time making lace and, on occasions when shells fell near, went placidly on with their work.

There was a big gun in the neighbourhood, which was familiarly known as *Tin Lizzy*. She was a horribly noisy neighbour on the occasions when she was at work. From time to time the Boche tried to reach her with shells, but never successfully.

It was an exhilarating moment when one got into a motor ambulance to return from the advanced dressing station to our headquarters in Poperinghe. It meant the near prospect of a change of clothes, sleeping in pyjamas, a bath in the morning and freedom to amuse oneself during the day. One had, of course, to take one's turn at orderly duty. This meant being about the headquarters for 24 hours, taking sick parades. In one's leisure time one could ride about and explore the neighbouring country.

Poperinghe was shelled from time to time in a desultory manner while our headquarters were there and our sleep was broken frequently about an hour before daybreak by bomb raids. When our month of clearing was up we moved to a camp a short distance outside the town. There we had charge of the Division Rest Station. This was a field hospital on a small scale, for patients with minor ailments, who would be able to rejoin their units in four or five days. They were housed in two long huts and slept on stretchers. There was generally enough work to occupy every one during the mornings. The afternoons were devoted to playing games, principally baseball. We had plenty of time to ride about and look up friends in other units. Once a week every man attended a bath parade. The divisional baths were in Poperinghe. The men marched there with their towels and had hot baths. At the same time they were given a change of underclothing and their outer clothes ironed to destroy pediculi and the nits.

We lived a peaceful existence till the 2nd of June, 1916. In the morning of that day we heard that our neighbours, a battery of the Lahore Artillery brigade, had orders to *stand to*. We knew then that something was in the air. At lunch a despatch was brought in to our Commanding Officer ordering us to *stand to* also. News then began to arrive that the Germans were violently shelling the front line of our division and that one of the best battalions in the Canadian Army had suffered very heavily. By midnight our camp was emptied of every available man. Some went up to the advanced dressing stations and others to the main one.

For several nights the work was very heavy. It was believed in England that this might be the beginning of a third battle of Ypres. At first the Germans gained a good deal of ground and inflicted heavy casualties on our division. There were over five thousand killed, wounded and missing. Another Canadian Division came in later, a heavy counter attack was made and nearly all the lost ground was regained. Our field ambulance was singularly fortunate in not having any of our men

killed and only a few slightly wounded. In many cases our stretcher bearers had the wounded men they were carrying on stretchers, killed. One of our men was carrying a wounded man pick-a-back when a piece of shell took the wounded man's head completely off. The severe fighting gradually died down, the casualties became less and less and our division was withdrawn from the line to rest and reorganize. I was sent in charge of a tent subdivision to Steenvoorde, a delightful little French town about seven miles from Poperinghe just within the frontier. I had with me two officers of the field ambulance. We looked after the sick of some of the battalions of our division, who were billeted in the neighbourhood. In our leisure time we rode over to Hazebrouck and Bailleul, both of which places have so often been mentioned in accounts of recent fighting.

One day I received an invitation from my Commanding Officer to return to headquarters outside Poperinghe to play in a cricket match between the commissioned and noncommissioned officers of our field ambulance. I started off on horseback with an orderly and when I began to approach Poperinghe found, to my disgust, that the town was being shelled. I soon began to meet ambulances loaded with civilian as well as military wounded. At the entrance of the town we were stopped by a military policeman and told that the road was closed. We turned back and by making a detour around the outskirts of the town were able to reach camp in time for luncheon. We played our match in the afternoon and while playing could hear the whizz of the big shells going into Poperinghe. After dinner the shelling had stopped and we rode back through the town. The troops had been withdrawn and most of the inhabitants had left, so it presented a forlorn appearance. We had ample opportunity to see the damage done since we had been there last.

Our second turn of duty in the salient came in August and was very different from the first. The battle of the Somme was then in full blast and the Germans had removed many of their guns. We must have been firing ten shells for their one. The weather was hot and dry so that life in cellars and dugouts was not so uncomfortable.

All the time I was in the field ambulance I never gave an anesthetic, nor saw one given. The first place on the way to the base where operations are performed is the Casualty Clearing Station. The important thing in a field ambulance is to get rid of the wounded as quickly as possible in order to be prepared for more and to be able to move with the division, if necessary. The Casualty Clearing Station is just out of the range of shell fire. It is a field hospital which is less mobile than a field ambulance. As a rule only urgent cases are operated on or were at that time, the rest being put in the train and sent as quickly as possible to a base hospital.

In a severe action a C. C. S. is very busy and I cannot imagine any place where the services of a skilled anesthetist would be more useful. A C. C. S. cannot, however, afford to have too much cumbersome apparatus as when the army moves, it moves too.

Later on in the year 1916, I was sent down to the base again to join No. 1 Canadian General Hospital, which was in need of an anesthetist. There at times the work was very heavy from the Somme fighting. We had four operating tables going simultaneously. One day we had over 70 operations. A few days before we had admitted 760 wounded within 24 hours. There were a great many severe chest wounds. I found the surgeons had a preference for opening empyemata, in bad cases, under nitrous oxid and oxygen. I became convinced that this was, with the apparatus we had, the worst possible anesthetic to use, and urged the use of local anesthesia. I saw very little spinal anesthesia used, though I believe it is popular in some hospitals. At the Duchess of Westminster's Hospital at Le Touquet the anesthetist used intravenous ether with, I believe, most satisfactory results.

One of the after effects of the war will be that the world will be flooded with young men who will call themselves surgeons. A youngster straight from college or who has had a few years of country practice is put in charge of a surgical ward and is allowed either by press of work or by lack of vigilance on the part of the officer in charge of surgery to do an amount of operating, to which he is not entitled by his training or his capabilities. Before he has had time to see the effect of his work his cases are evacuated to another hospital. The patient does not know who he is. There are no critical neighbours or relatives to bring his mistakes home to him. He, therefore, develops self-confidence much more quickly than knowledge, skill or judgment.

Moreover, his pay remains the same whether he works hard or does nothing, and if he is not very conscientious he is liable to do as little as possible and to get careless about the little he does.

Military surgery will make some men into good surgeons, but it will be the spoiling of the medical careers of many more.

When one looks back at the time spent at the front, one remembers most easily the good times, the good comradeship, the merry parties and the making of new friendships. It fortunately takes a certain effort to recall the long periods of intolerable boredom and home-sickness.

To anyone going with the army, I would give one piece of advice. Do not worry about getting a large number of hand-knitted socks or the last pattern of sleeping bag or water bottle. It is not these which will make you comfortable. The important thing is to go with congenial associates. Devote your attention before you go to getting into the same unit with one or more tried friends.

183 MANSFIELD ST.

THE OPERATIVE RISK IN CARDIAC DISEASE.*

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Since the publication of our previous article on the operative risk in cardiac disease,[1] the number of operative cases complicated by heart disease examined in the Mayo Clinic has markedly increased. Other groups of cardiopaths have been added to the classification, and also they have been included in this report. The greatest difficulty encountered was the classification of cardiopaths into groups of similar patients for comparative study and while the grouping employed is not beyond criticism, it gives a working basis for risk determination. A paper of this sort necessitates the incorporation of statistical data and the presentation of such data is apt to be dominated by monotony. A search of medical literature revealed only scattered reports of operative risk in cardiac disease.

This report does not include all the cases of heart disease coming to operation in the Clinic but it does include those in which electrocardiographic examinations have been made since August, 1914. The advent of the electrocardiograph has been very helpful in the classification of cases by permitting the recognition of otherwise obscure conditions.

Experience has shown that the best index of operative risk in heart disease is the patient's ability to stand physical strain, supplemented, of course, by thorough history taking and thorough physical examination. Patients whose hearts allow them to go about in comfort, or those in whom this can be effected by medical treatment, are generally considered safe for operation.

In heart disease due to focal infection, such gratifying results are frequently seen following the removal of the focus, that the added risk seems justified. Another group of cases often shows marked cardiac improvement sufficient fully to justify the risk, namely, goiter, uterine fibroids and prostatic hypertrophy. Malignancy complicated by heart disease is generally considered operable if a fair chance for recovery is offered, and such cases often require palliative operations. In very few instances in which there has been urgent need of operation has it been refused on account of the cardiac condition, though in many instances, operation has only been undertaken after preliminary medical therapy.

In every case the decision is based on several factors: (1) The immediate operative risk, (2) the probable improvement of the heart following operation, (3) the patient's relative chance for length of life or general health with and without operation, and (4) in less serious conditions, whether or not the operative relief will justify the added risk. Experience in general has justified the taking of risks in cases demanding surgical intervention.

It is impossible to classify cases on a basis of valvular disease alone because the true index of cardiac efficiency is myocardial quality and this varies greatly in similar disease conditions. A classification based on cardiac reserve alone is also impossible because we have no accurate means of determining this factor and clinical impressions are variable.

Six groups of cases have been studied. These are generally recognized as bad risks, or the worst risks, if angina pectoris and aneurysm are excepted. The groups are: (1) Auricular fibrillation, (2) auricular flutter, (3) impaired auriculo-ventricular conduction, (4) impaired intraventricular conduction (arborization block) (5) mitral stenosis, and (6) aortic lesions including valvular disease, aortitis and dilatation (not aneurysmal.)

Auricular Fibrillation.—This disorder is now recognized as being due to incoördinate contraction of individual muscle bundles of the auricular wall. The auricles no longer contract, their walls dilated in diastole act as reservoirs in the general circulation. As the result of this disordered and inadequate stimulus production, the ventricular response is incoördinate and a pulse results which is usually totally arrhythmic. This condition may be chronic, intermittent or paroxysmal.

*Read during the Sixth Annual Meeting of the American Association of Anesthetists, Auditorium Hotel, Chicago, Ill., June 10-11. 1918.

Exophthalmic Goiter.—Experience with exophthalmic goiter (hyperplastic toxic) has shown auricular fibrillation to be a frequent, disordered cardiac mechanism occurring in the course of the disease. Fibrillation occurs more frequently in the patient more than 40 years of age, and is often indicative of a relatively high degree of hyperthyroidism. The myocardiums of older patients, of course, do not tolerate toxic insults well, and fibrillation is very prone to be a permanent condition. The occurrence of this arrhythmia in young people usually evidences a high degree of hyperthyroidism for the hearts of younger patients usually stand strain well. In this group, 104 patients have been operated on with 4 deaths. One patient died following a Porter hot water injection and 3 following thyroidectomy. Of the latter, 2 died of hyperthyroidism and 1 of myocardial insufficiency on the second day after operation. Ten patients were under 30, twenty between 30 and 40 and seventy-four were more than 40 years of age. The operative mortality was 4 deaths in 104 cases (3.8 per cent) which compares favorably with the normal operative mortality of 2.6 per cent.

Thyrotoxic Adenomas.—Many patients having adenomas (simple goiter) for a certain number of years, develop symptoms of thyroid intoxication. The onset of symptoms is frequently insidious and the initial subjective complaints, those of a failing myocardium. These patients are usually older, beyond 40 years of age, and as I have mentioned, the heart muscle does not tolerate toxic influences well. Added to this is an insidious onset. This group presents many cardiopaths. Experience has shown that such patients so often show striking cardiac improvement following thyroidectomy that the added risk seems fully justified. All patients with fibrillation are, however, subjected to preliminary medical treatment which is continued after operation if the case demands it. Thirty-six patients with fibrillation had thyroidectomies with one operative death, giving a mortality of 2.7 per cent. The normal operative mortality in this group is 2.8 per cent. The favorable showing is owing largely to preoperative therapy and to the correlation between the surgical and medical services.

Other Conditions.—There were 10 cases of fibrillation in patients less than 40 years of age and 20 in those more than 40 years of age, constituting a total of 30 cases in which operative measures were employed. The operations were as follows: 12 tonsillectomies, 4 excisions of epitheliomas (2 lower lip, 1 glands of the neck and 1 larynx), 1 excision of glands for diagnosis (sarcoma), 3 cholecystectomies and appendectomies, 3 gastro-enterostomies (2 for ulcer and 1 for carcinomatous obstruction), 1 cholecystectomy, choledochotomy and appendectomy, 1 Talma-Morrison, 1 herniotomy, 1 cataract extraction, 1 suprapubic stab, 1 cauterization for urethral caruncle and 1 cystotomy and prostatectomy. There were 2 early deaths, 1 cardiac, following suprapubic stab, and 1 due to cholangitis following cholecystectomy.

Auricular Flutter.—This cardiac disorder is recognized as being due to rapid coördinate contractions of the auricles, stimulated by foci of irritation located in the auricular wall outside the normal pace-maker (sino-auricular node). The auricles contract at a rate of 200 to 380 per minute and the ventricles respond usually to one-half the auricular contractions, although any rhythm from a 1:1 association to a complete heart block may exist. The pulse is regular in one-half the reported cases and grossly irregular in the other half. The degree of block may vary from time to time and most patients are subject to paroxysmal "weak spells," owing to sudden decrease in the degree of block which allows the ventricles to assume full auricular rate. The condition is usually chronic and may exist for years.

Four patients have been operated on, all included in the foregoing under fibrillation. These patients are of particular interest as apparently being the first proved cases of flutter coming to operation. A previous report[2] showed that these four patients were subjected to vigorous digitalis therapy, and rest until fibrillation was induced, and then operation was done.

Three of the patients had exophthalmic goiter, though one had a cholecystectomy and tonsillectomy in the Clinic and a thyroidectomy, later, elsewhere. One other patient had had tonsillectomy. All the patients with exophthalmic goiter resumed a normal rhythm after operation, and two had no further cardiac symptoms. The last patient on whom a tonsillectomy was performed, reports himself greatly improved. Thus far there has been no mortality.

Partial and Complete Heart Block.—One patient with complete block has had three operations in 11 years; appendectomy, radical amputation of the breast for carcinoma, and excision of recurring nodules of the skin. An electrocardiogram was taken before the last operation. The pulse was recorded as being unusually slow at the previous examinations. The patient is alive and quite well.

Ten patients showing delayed conduction between auricles and ventricles, that is, auriculo-ventricular intervals of 0.22 to 0.28 of a second, have been operated on as follows: 4 tonsillectomies, 1 double ligation of the superior thyroid vessels for exoph-

thalmic goiter, 1 double ligation and subsequent thyroidectomy for exophthalmic goiter, 2 thyroidectomies for thyrotoxic adenomas, 1 cholecystectomy and 1 prostatectomy. Six were more than 40 years of age and 4 were under 40 years. The patient on whom prostatectomy was done died on the fourth day, presenting the cardio-vascular renal syndrome.

Intraventricular or Arborization Block.—This condition is due to impaired conduction of the cardiac impulse after after its passage through the bifurcation of the auriculo-ventricular bundle and evidences disease of the main bundle branches and the subendocardial plexus. Oppenheimer and Rothschild have emphasized the gravity of this condition and the early fatality which often indicates. The electrocardiogram reveals a prolonged Q. R. S. interval and variations from slight notching to the unusual complexes which are ascribed to branch bundle defects. A striking observation in this group of cases is the uniformity with which the clinical findings are substantiated by the graphic records in revealing serious myocardial disease. Twenty patients have been operated on, 7 under 40 years of age and 13 more than 40 years, without any operative mortality. There were 8 tonsillectomies, 5 thyroidectomies (3 for exophthalmic goiter and 2 for thyrotoxic adenoma), 1 salpingectomy, 1 cholecystectomy and appendectomy, 2 chest aspirations, 2 gland excisions for diagnosis (1 malignant and 1 inflammatory) and 1 posterior gastro-enterostomy for duodenal ulcer.

Mitral Stenosis.—Seventy-three cases of mitral stenosis are recorded in which operations were done. Twenty-five of the patients were under 40 years of age and 48 were more than 40 years. As previously stated, valvular disease alone cannot be satisfactorily grouped because of the difficulty in accurately classifying the degree of myocardial insufficiency. This mitral lesion is recognized as being serious owing to its tendency to progression, and therefore the cases have been included in this report. An attempt has been made to estimate by clinical impressions the degree of decompensation present, and, while obviously inaccurate, it is necessary in presenting the type of case represented in this study. The scale of 1 to 4 (minimum to maximum) has arbitrarily been used in denoting the degree of decompensation. The average in patients under 40 years of age was 2, in those more than 40, 2+. Ten patients showed auricular fibrillation; (vide supra) 9 of these were patients more than 40 years of age. The operations are as follows: 39 tonsillectomies, 17 thyroidectomies (10 for simple goiter, 4 for exophthalmic goiter, and 3 for thyrotoxic adenomas), and 4 of these patients had secondary operations including 2 tonsillectomies, 1 appendectomy and 1 double cataract extraction. There were one double ligation of the superior thyroid vessels for exophthalmic goiter, 4 appendectomies, 1 cholecystostomy, 4 cholecystectomies and appendectomies, 1 choledochotomy, cholecystectomy and appendectomy, 1 subtotal abdominal hysterectomy, 1 perineorrhaphy, 1 trachelorrhaphy, 1 tumor excision (benign) 1 inguinal herniotomy and 1 thoracic paracentesis. There was no immediate operative mortality but one patient died two weeks later of cholangitis following a choledochotomy, cholecystectomy and appendectomy. The mortality in this group is 1.3 per cent. It is impossible accurately to state the normal mortality in such a protean surgical list but 1.5 per cent seems very conservative.

Aortic Lesions.—It has long been recognized that aortic disease needs no emphasis as regards its gravity. This group includes aortic valvular disease, aortitis and dilatation (not aneurysmal). Sixteen patients with aortic valvular disease have been operated on; 11 under 40 years of age and 5 more than 40 years. Six patients presented double aortic lesions, that is, insufficiency and stenosis, and 1 presented evidence of aortitis. One patient had aortic stenosis alone. These patients were all able to be up and about with relative comfort. Anginal pains were not elicited in a single instance. There were no operative deaths but 1 patient is reported dead from heart failure one year later (tonsillectomy). There were 12 tonsillectomies, 1 thyroidectomy for adenomas, 1 cholecystectomy, 1 double herniotomy and appendectomy, and 1 chest aspiration. Two patients with aortitis (not including the aforementioned case) were operated on; both were more than 40 years of age. There were one exploration (general abdominal carcinosis) and 1 tonsillectomy. The latter patient died a cardiac death three months later. Four patients with dilatations of the aorta (not aneurysmal) underwent surgical procedures. The clinical diagnoses in these cases were verified by the fluoroscope. Three of the patients were more than 40 years of age. There were 2 thyroidectomies for exophthalmic goiter, 1 tonsillectomy, and 1 cystotomy and herniotomy. There were no deaths.

SUMMARY.

1. The decision of operability in cardiac disease depends on factors as follows: (1) The immediate operative risk, (2) the probable improvement of the heart after operation, (3) the patient's relative chance for length of life or general health with and without operation, and (4) in less serious conditions, whether the operative relief will justify the added risk.

2. Cases in which the heart permits the patient to go about in relative comfort, or in which it can be sufficiently restored by treatment to allow this, usually are considered safe for operation.

3. Malignancy complicated by heart disease is usually considered operable if a fair hope of cure is offered.

4. The best measure of operative risk is a good clinical impression of the patients' ability to stand physical strain, supplemented by a careful history and a thorough physical examination.

5. Preoperative medical therapy and rest combined with surgical and medical correlation after operation is of paramount importance.

6. The general tendency is to require too great a margin of cardiac safety in surgical work.

DISCUSSION.

DR. WM. HAMILTON LONG, Louisville, Ky.:—I should like to ask Dr. Willius if, at the Mayo Clinic, the technic of anesthesia is in any way modified by the cardiac condition presenting at the time of operation and whether one or more anesthetics have been found available or preferable for distinctive cardiac risk?

DR. WILLIUS, (Closing):—In handling major operations at our clinic, irrespective of the peculiar cardiac conditions, the open drop-method of etherization is used and has been found safe, satisfactory and apparently harmless. Local anesthesia has been found useful in certain cardiac risks presenting for such operations as tonsillectomy and it has also been found safe and efficient. It is difficult to fully judge the element of additional risk which the anesthetic introduces as so many other factors of physio-pathological importance are also involved. In calculating the results of operation and the effects of anesthesia, it is my impression that ether does not of itself exert a detrimental influence on cardiac risks, who have had proper care in preparation. Provided the trauma of the operation is not increased by etherization to the point of depression, the anesthetic, if it has any appreciable action, is beneficial.

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FROM WHATEVER ANGLE IT MAY BE CONSIDERED, AN INVESTMENT IN LIBERTY BONDS OR WAR SAVING STAMPS IS THE BEST INVESTMENT IN THE WORLD. THE MONEY SO INVESTED GOES TO THE GOVERNMENT, WHICH LOANS SOME OF IT TO OUR ALLIES; ALL OF IT IS USED, IN ONE WAY OR ANOTHER, TO MAINTAIN, SUPPORT, ARM AND EQUIP, AND MAKE VICTORIOUS OUR ARMIES AND OUR ALLIES IN EUROPE. SURELY YOUR MONEY COULD NOT BE PUT TO A BETTER PURPOSE. HERE IS AN INVESTMENT IN THE POWER AND SUCCESS OF OUR COUNTRY, AN INVESTMENT IN THE EFFICIENCY, STRENGTH, SAFETY AND SUCCESS OF OUR FIGHTING MEN ON LAND AND SEA.

THE PROPHYLACTIC USE OF PITUITRIN IN NOSE AND THROAT OPERATIONS UNDER GENERAL AND LOCAL ANESTHESIA.*

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The action of extracts of the infundibular portion of the hypophyseal gland on the circulation has been well established through the investigations of Schaefer and Oliver, Howell, Houghton and Merril, Beck and O'Malley, Klotz, Wiggers and others and may be briefly summarized as follows:

1. The blood pressure is raised from five to thirty-five millimeters within a few minutes through direct stimulation of the muscle coats of the arterioles.

2. This increase in blood pressure is prompt and the fall to normal, on the contrary, very gradual.

3. Due to the constriction of the arterioles the actual size of the various organs of the body is diminished with the rise in blood pressure. The kidneys are the only exception to this rule, as they become enlarged upon receiving the pituitary extract and the output of urine is increased.

4. The heart, according to the majority of investigators, is slowed down, probably due to direct depression of the heart muscle, and there is a diminution in the amplitude of the heart's excursions as demonstrated by Wiggers. Also there is a peculiar grouping of the heart beats in periods of two or more. All of these manifestations are most marked just after the crest in the blood pressure curve has been passed.

Based upon these facts the employment of pituitrin in connection with nasopharyngeal surgery was first given an impetus by Cetelli, who reported brilliant results in a number of turbinate and tonsils operations, where it had been used either as a prophylactic or for the control of postoperative hemorrhage. His clinical findings were generally corroborated by other operators with the single exception of Donelan, who, having employed it in twenty-five cases, reported that he could see no difference in the amount of bleeding than in similar cases where no pituitrin had been used.

In 1915, Kahn and Gordon reported their results in a series of 100 cases, mostly children, where they had used pituitrin as a prophylactic. They paid particular attention to the blood pressure and coagulation time of the blood taken before and after the administration of the agent. They found that the

*Read during the Sixth Annual Meeting of the American Association of Anesthetists, Auditorium Hotel, Chicago, Ill., June 10-11, 1918.

systolic pressure had been increased in 55.31 per cent. of the cases, reduced in 36 per cent. and unchanged in 8.5 per cent and that the coagulation time had been reduced in nearly every instance.

A short time ago I took occasion to report the results in a series of 100 cases of my own in which pituitrin had been given as a prophylactic and for the control of postoperative hemorrhage. The results considered solely from the clinical point of view were very gratifying. Briefly they showed that in 35 tonsillectomies done under local anesthesia there was only one severe primary hemorrhage, four moderate and 29 slight. Five cases had a postoperative bleeding. In the 53 cases done under general anesthesia there was one severe primary hemorrhage, 16 moderate and 33 slight. There were no secondary or postoperative hemorrhages in this group.

My present report concerns 48 cases in which pituitrin was given solely as a prophylactic against hemorrhage and comprises a study not only of the amount of the bleeding but also of the effect on the blood pressure and coagulation time. The proceedure was as follows: Blood pressure and coagulation were taken and followed immediately by a hypodermic of pituitrin, 1 cc. to adults and ½ to 1 cc. to children. After a lapse of fifteen minutes the blood pressure and coagulation time were again taken and the patient sent to the operating room. As the majority of the cases were operated on in the afternoon, I had the blood pressure taken again on the following morning before the cases were dismissed from the hospital.

The striking features of these experiments, showing the action of the pituitrin were the uniform and prompt rise in blood pressure, the consistent lowering of the coagulation time and the absence of postoperative hemorrhage. These we shall consider seriatim.

BLOOD PRESSURE.

All of the cases, with but one exception, showed a rise in blood pressure averaging 10mm. systolic and 6mm. diastolic, which was manifest fifteen minutes after the injection. This increase was maintained in 60 per cent. of the cases for as long as 18 hours. At the end of that time 18 per cent. of the remainder had reached the same level as prior to the injection and 22 per cent. had fallen below that level. This demonstrates that the action of pituitrin is far from being short-lived and corroborates the statement of Klotz, who asserted that the increase in blood pressure may be sustained for as long as 24 hours. More significant in relation to the anesthesia is the fact that postoperative depression was combated to a great extent through the sustained blood pressure. Pituitrin has been used in a number of surgical conditions for the treatment of shock. Being prolonged in action, it exerts a twofold influence in these nose and throat operations when employed as a prophylactic and makes for a more prompt recovery.

COAGULATION TIME.

Determining the coagulation time of the blood is a more or less variable procedure because of the variety of methods that may be employed and the difference in judgement as to the exact moment when the coagulation may be considered complete. To be absolutely correct and avoid mixing the blood with tissue juices as in skin punctures one would have to take the blood directly from a vein. In the present series this was not feasible and we had to resort to the old fashioned ear puncture, inaccurate though it may be for the determination of the absolute coagulation point. However, the method by which coagulation time is determined is really immaterial for comparative purposes as long as the same method is employed in each case on both occasions, the punctures made in the same manner, a free flow of blood established without massaging the tissues and drops of equal size examined. These precautions were observed and the results showed definitely a decrease in coagulation time of from ½ to 5 minutes. The slowest coagulating blood (case No. 9) which took nine minutes was reduced to four minutes by the pituitrin. There was only one case in which the coagulation was unaffected, (case No. 18), although this case showed an average rise in blood pressure with a return to normal within 18 hours.

PRIMARY HEMORRHAGE.

The amount of blood lost at the time of operation was none or slight in 74 per cent and moderate in 26 per cent of all cases. In relation to the anesthesia, of fifteen cases done under ether, ten were accompanied by slight and five by moderate bleeding of which one was controlled by ligature and the other four by pressure. Of 33 cases done under local anesthesia 25 showed a slight and eight a moderate bleeding all of which were controlled by direct pressure.

POSTOPERATIVE HEMORRHAGE.

There was only one case in which postoperative bleeding was noted; occurring eight hours after a moderate primary bleeding in a young woman of eighteen whose tonsils were removed under local anesthesia. This patient, by the way, showed a rise in blood pressure under the influence of pituit-

THE PROPHYLACTIC USE OF PITUITRIN IN NOSE AND THROAT OPERATIONS UNDER GENERAL AND LOCAL ANESTHESIA.

No.	Name	Age	Operation	BLOOD PRESSURE: Before Injection	BLOOD PRESSURE: 15 Min. After Injection	BLOOD PRESSURE: 18 Hours Later	COAGULATION TIME: Before Injection	COAGULATION TIME: 15 Min. After Injection	Primary Bleeding	Secondary Bleeding	Anesthesia Remarks	Remarks	No.
1	T. S.	24	Tonsil	135 S. 100 D.	152 S. 118 D.	130 S. 90 D.	5′	2′	Venous requiring pressure	None	Cocain Quinin & Urea		1
2	D. S.	22	Septum	134 S. 96 D.	142 S. 102 D.	115 S. 85 D.	4′ 15″	3′	None	None	Cocain		2
3	D. F.	26	Tonsils	120 S. 90 D.	130 S. 98 D.	125 S. 94 D.	5′ 50″	3′ 10″	Slight	None	Ether	Secondary operation	3
4	L. B.	21	Tonsils	115 S. 87 D.	120 S. 92 D.	120 S. 94 D.	3′	1′	Slight	None	Cocain Quinin & Ur.	Secondary operation	4
5	A. H.	20	Tonsils	125 S. 96 D.	139 S. 98 D.	130 S. 95 D.	9′	4′	Moderate requiring pressure	None	Cocain Quinin & Ur.		5
6	F. S.	28	Septum & Mid. Turb.	120 S. 85 D.	130 S. 92 D.	120 S. 90 D.	5′	3′ 30″	None	None	Cocain	Patient has T. B.	6
7	L. S.	4	Tonsils & Adenoids	85 S.	98 S.	90 S.	2′	1′ 15″	Slight	None	Ether		7
8	A. L.	30	Antrum	135 S. 100 D.	142 S. 110 D.	138 S. 105 D.	4′ 30″	1′ 30″	None	None	Cocain	Secondary operation	8
9	M. B.	11	Tonsils & Adenoids	103 S. 72 D.	110 S. 90 D.	105 S. 80 D.	3′	2′ 35″	Slight	None	Ether		9
10	F. M.	29	Tonsils	115 S. 87 D.	128 S. 95 D.	120 S. 90 D.	6′ 30″	2′ 30″	Slight	None	Cocain Quinin & Ur.		10
11	R. S.	21	Septum	100 S. 75 D.	125 S. 90 D.	118 S. 82 D.	5′ 15″	2′	None	None	Cocain		11
12	M. S.	35	Tonsils	110 S. 82 D.	115 S. 90 D.	112 S. 83 D.	4′ 35″	1′ 30″	Slight	None	Cocain Quinin & Ur.		12
13	C. T.	25	Tonsils	115 S. 88 D.	120 S. 90 D.	115 S. 88 D.	3′	1′	Slight	None	Cocain Quinin & Ur.		13
14	E. W.	17	Tonsils	122 S. 88 D.	130 S. 96 D.	117 S. 86 D.	4′	2′ 30″	Moderate	None	Ether	Took the anesthetic poorly	14
15	A. W.	10	Tonsils & Adenoids	100 S. 80 D.	108 S. 84 D.	102 S. 80 D.	2′ 30″	1′ 10″	Slight	None	Ether		15
16	D. B.	22	Septum	132 S. 100 D.	138 S. 105 D.	130 S. 100 D.	3′ 30″	1′ 15″	None	None	Cocain		16
17	H. L.	28	Tonsils	130 S. 95 D.	140 S. 100 D.	132 S. 97 D.	6′	2′ 15″	Profuse venous: required pressure	None	Cocain Quinin & Ur.	Gagged violently: Oper. lengthy	17
18	R. Z.	17	Tonsils	100 S. 88 D.	108 S. 93 D.	100 S. 88 D.	3′	3′	Slight	None	Cocain Quinin & Ur.		18
19	I. C.	29	Septum	115 S. 90 D.	123 S. 92 D.	120 S. 90 D.	3′	2′ 15″	Slight	None	Cocain		19
20	M. M.	19	Tonsils	120 S. 90 D.	122 S. 94 D.	104 S. 82 D.	6′ 30″	2′	Slight	None	Cocain Quinin & Ur.		20
21	J. B.	19	Tonsils	115 S. 85 D.	120 S. 87 D.	120 S. 88 D.	5′	1′ 30″	Slight	None	Ether		21
22	M. L.	38	Tonsils	122 S. 90 D.	138 S. 97 D.	122 S. 92 D.	2′ 30″	1′	Slight	None	Cocain Quinin & Ur.		22
23	M. B.	23	Tonsils	110 S. 82 D.	116 S. 88 D.	105 S. 80 D.	4′	2′ 30″	Slight	None	Cocain Quinin & Ur.		23
24	G. M.	34	Tonsils	130 S. 92 D.	142 S. 100 D.	135 S. 95 D.	5′	3′	Slight	None	Cocain Quinin & Ur.		24
25	L. R.	24	Tonsils	120 S. 90 D.	126 S. 92 D.	118 S. 87 D.	4′	1′ 15″	One spurter clamped	None	Cocain Quinin & Ur.		25
26	O. G.	20	Tonsils	100 S. 75 D.	115 S. 80 D.	100 S. 75 D.	6′	1′ 45″	Moderate	None	Cocain Quinin & Urea		26
27	A. O.	27	Septum	118 S. 93 D.	130 S. 95 D.	120 S. 90 D.	3′	1′	None	None	Cocain		27
28	D. M.	16	Tonsils	117 S. 82 D.	120 S. 85 D.	117 S. 80 D.	2′	1′	Slight	None	Ether		28
29	J. G.	15	Tonsils	117 S. 88 D.	123 S. 90 D.	120 S. 90 D.	4′	1′ 25″	Slight	None	Cocain Quinin & Urea		29
30	E. B.	15	Tonsils	108 S. 82 D.	110 S. 80 D.	112 S. 80 D.	2′	1′ 30″	Slight	None	Ether		30
31	A. B.	38	Tonsils	132 S. 95 D.	140 S. 98 D.	130 S. 90 D.	3′	2′	Slight	None	Cocain Quinin & Urea		31
32	A. F.	17	Tonsils	122 S. 88 D.	130 S. 92 D.	120 S. 90 D.	4′ 20″	3′	Arterial: ligature applied.	None	Ether		32
33	C.C.	27	Septum	126 S. 88 D.	130 S. 94 D.	124 S. 90 D.	2′	1′ 30″	None	None	Cocain		33
34	R. S.	20	Tonsils	142 S. 102 D.	135 S. 98 D.	135 S. 97 D.	2′ 15″	1′ 30″	Slight	None	Cocain Quinin & Urea		34
35	E. E.	33	Septum	124 S. 90 D.	128 S. 96 D.	124 S. 90 D.	2′ 30″	1′ 50″	None	None	Cocain		35
36	M. M.	43	Tonsils	140 S. 100 D.	148 S. 100 D.	Not taken	3′ 50″	2′	Arterial: controlled by press.	None	Cocain Apothesine		36
37	H. L.	14	Tonsils	115 S. 80 D.	123 S. 85 D.	118 S. 82 D.	4′	2′ 30″	Slight	None	Ether		37
38	A. P.	20	Tonsils	125 S. 92 D.	138 S. 98 D.	138 S. 93 D.	3′	1′ 25″	Moderate	None	Ether		38
39	S. G.	24	Tonsils	133 S. 94 D.	147 S. 99 D.	140 S. 90 D.	4′	1′ 35″	Slight	None	Cocain Quinin & Urea		39
40	G. B.	9	Tonsils	100 S.	116 S.	99 S.	4′ 30″	2′ 30″	Slight	None	Ether		40
41	M. S.	19	Tonsils	126 S. 94 D.	140 S. 94 D.	130 S. 86 D.	2′	1′ 40″	Slight	None	Cocain Quinin & Urea		41
42	F. B.	23	Tonsils	122 S. 90 D.	135 S. 95 D.	124 S. 92 D.	3′	1′ 50″	Slight	None	Ether		42
43	G. B.	18	Tonsils	119 S. 87 D.	130 S. 98 D.	127 S. 90 D.	4′	3′	Moderate	Slight about 8 hours later	Cocain Aposthesine		43
44	J. D.	26	Tonsils	120 S.	130 S.	123 S.	6′	2′ 30″	Moderate	None	Cocain Quinin & Urea	Small clot a few hours later	44
45	R. G.	21	Tonsils	120 S. 90 D.	135 S. 98 D.	128 S. 92 D.	4′	1′ 30″	Slight	None	Cocaine Apothesine		45
46	L. B.	32	Tonsils	132 S. 94 D.	145 S. 99 D.	140 S. 95 D.	3′	1′ 25″	Slight	None	Cocain Quinine & Ur.	Had ½ strength HMC before op.	46
47	M. A.	23	Tonsils	122 S. 90 D.	140 S. 98 D.	130 S. 92 D.	2′	1′ 30″	Arterial: con. by pressure	None	Ether		47
48	M. P.	20	Tonsils	116 S. 80 D.	125 S. 84 D.	123 S. 86 D.	Not taken		Moderate	None	Ether		48

rin from 119 S.-87 D. to 130 S.-98 D., lasting until the following morning when the readings were 127 S.-90 D. Her coagulation time had been reduced from four to three minutes. Aside from this case there was only one other patient who had a clot form in the tonsillar fossa, the remainder being entirely free from blood.

Considering the series as a whole 13 of the 48 cases showed a moderate primary hemorrhage and 35 only a slight bleeding. I employ the latter term as referring to a bleeding that ceases promptly after the wound had been made and requires no topical application of any sort. Of the 13 moderate hemorrhages, eight were venous easily controlled by by direct sponge pressure. The other five were distinctly arterial, the spurters being either clamped or compressed. (In one case a ligature was applied.)

The fact that there was only one postoperative hemorrhage (that being a very slight one, is evidence of the efficacy of the prophylactic which is further born out by the persistence of the action of the pituitrin as shown by the continued elevation of blood pressure.

As to untoward manifestations directly attributable to the pituitrin, the only one noted was the occurrence of uterine contractions in several of the female patients. Some of them complained of *cramps* a short time after the administration of the hypodermic which lasted from fifteen minutes to an hour but were not severe enough to require any particular attention.

In closing it must be pointed out that pituitrin is contra-indicated in cases of arteriosclerosis or high blood pressure from other causes.

I desire to express my appreciation to Dr. L. B. Phelps of the staff and Drs. Casserly and Adamo, internes of the Francis Willard Hospital for courtesies shown and assistance rendered in the assembling the data of this series.

25 E. WASHINGTON ST.

DISCUSSION.

DR. JOHN W. SEYBOLD, Denver, Col.:—I recall one case in which I used pituitrin for hemorrhage after a tonsillectomy, when all other remedies and methods had failed, and in that instance it proved a life-saver.

DR. BEN MORGAN, Chicago, Ill.:—Pituitrin has been a hobby with me. I cannot say, however, that my experiments with it on animals has verified some of the effects claimed for pituitrin clinically. In experiments on dogs the blood pressure is not maintained for any length of time. Clinically, however, I have found its use invaluable for shock, especially in operations for abdominal tumors. One of its peculiarly valuable features is its re-establishment of peristalsis postoperatively. So far as tonsillectomy is concerned it must be remembered that the sort of anesthesia used and the expertness with which the anesthesia is handled may materially influence the factor of hemorrhage. While pituitrin may be used routinely as Dr. Salinger suggests, it would be contra-indicated in patients who are pregnant for fear of its effects.

DR. R. M. WATERS, Sioux City, Iowa:—I am rather inclined to credit the excitment incident to the dread of operation for the blood-pressure results which Dr. Salinger has presented.

DR. E. I. MCKESSON, Toledo, Ohio:—The question arises as to what is a normal amount of hemorrhage after tonsil operations. My experience in giving anesthesia for many operators, leads me to believe that hemorrhage is a very variable factor. The best operators probably have some ten hemorrhages in a thousand cases; other and less skillful operators have many more. Personally I have found that in using nitrous oxid-oxygen for tonsil operations in the forward-inclined-sitting posture; hemorrhage, with a skilled operator, in negligible and may be remarkably controlled by immediate oxygenation as soon as the operation has been completed.

DR. F. H. MCMECHAN, Avon Lake, Ohio:—I can personally vouch for the efficacy of pituitrin as a hemostatic, both for prophylaxis and control. On two occasions at least it has kept me from being exsanguinated from hemophiliac bleeding. Perhaps its most interesting effect is in its psychic stimulation. Only those who have experienced a depleting hemorrhage and the prompt resuscitation of pituitrin can appreciate its immediate and prolonged effect. I have also found pituitrin of value in the control of anaphylactic shock due to reinfections in arthritis.

DR. SALINGER, (Closing):—Primary hemorrhage depends on many factors,—the technic, the anesthesia, the time consumed and the character of the tonsillar tissue involved. The comparative value of pituitrin as a prophylactic is not in preventing primary but secondary hemorrhage and in obviating psychic shock.. While the preoperative blood-pressure may be influenced by excitement, I am rather inclined to credit pituitrin with the very prolonged effect on blood-pressure which we have observed. It's action is not fleeting but endures from 18 to 24 hours. I am glad to hear Dr. Mechan corroborate these effects of pituitrin from personal experience. Physicians, whose patients I have operated upon, now tell me that they can tell the difference in those who have had pituitrin by their sense of well-being. Just what is involved in the effect of pituitrin on diminished coagulation time it is difficult to say, except that pituitrin is a very potent oxidizing agent.

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WE DO NOT KNOW WHAT COMMERCIAL AND INDUSTRIAL CONDITIONS WILL BE WHEN THE WAR CLOSES, BUT WE DO KNOW THAT LIBERTY BONDS AND OTHER U. S. GOVERNMENT SECURITIES WILL BE SOUND AND SECURE. WITH EVERY POSSIBLE DOLLAR INVESTED IN THE GOVERNMENT, THE AMERICAN PEOPLE WILL BE WELL PREPARED TO MEET THE PROBLEMS PEACE WILL BRING. INSURE THE FUTURE BY INVESTING LIBERALLY NOW.

COMBINED ANESTHESIA FOR CESAREAN SECTION.*

J. CLARENCE WEBSTER, M. D.,
CHICAGO, ILL.

During my nineteen years of work in the Presbyterian Hospital I have given great attention to the use of anesthetics in pelvic and abdominal surgery and in obstetrics. The indiscriminate use of ether has always seemed to me indefensible. I was one of the first to use the Schleich infiltration method, gradually adopting Solution No. 2:

Cocain muriat	0.100
Morphin muriat	0.025
Sod. Chlorid	0.200
Aq. distil.	100

as a standard.

I carried out many minor and major operations very satisfactorily in cases in which prolonged general anesthesia is not considered advisable, *e. g.*, old age, renal, pulmonary and cardiac diseases, marked anemia, chronic wasting diseases and sepsis.

In recent years, when the value and safety of novocain became established, I gradually employed it to a greater and greater extent, finally abandoning the use of the Schleich mixture.

Five years ago I first advocated the use of methylene blue to color the infiltrating solution in order that in operating one may be certain as to the extent of the area of infiltration. In this way the operator need not use knife, scissors or needle in an unanesthetized area, thereby protecting the patient from sudden pain.

About eleven years ago I began to use nitrous oxid gas and oxygen both in obstetric and in surgical work, either alone or in conjunction with local anesthesia. In the maternity department of the Presbyterian Hospital the analgesic use of nitrous oxid and oxygen in cases of labor has been established as a most valuable means of relieving suffering without risk to the mother or child, chiefly through the work of Drs. Lynch, Heaney and Henry Davis. Previous to 1909, Cesarean sections, whether abdominal or vaginal, had always been performed under ether or chloroform. In several cases of renal and pulmonary disease I had safely carried out these operations under nitrous oxid and oxygen. In 1909, I performed my first abdominal Cesarean section under local anesthesia. The case was that of an elderly primipara in advanced pregnancy with nephritis, the pelvic inlet being blocked by a tumor of the right side of the uterus. The patient was a stout woman, general edema being very marked. The abdominal wall was infiltrated with Schleich Solution, and after it was opened the uterus was incised without infiltration, the child removed, and afterwards the placenta and membranes. The uterine incision was closed with catgut and the abdominal wall then sutured, the entire operation lasting only twenty minutes and causing very little discomfort to the patient. Both mother and child were saved.

Three weeks ago, I again performed an abdominal section on this woman for adnexal disease. I found a symmetrical bicornuate uterus. There was a mere linear trace of my former incision in the left horn which had been pregnant, and to it the omentum was adherent. The tumor which had blocked the pelvis during the pregnancy was the greatly hypertrophied non-pregnant right horn which had been gradually forced downwards under the pregnant horn.

As a result of this experience in 1909, I employed local anesthesia in all cases of Cesarean section in which ether did not seem to be advisable. Gradually I adopted it also in cases in which ether might safely be used. The youngest female in whom the local anesthesia has been employed was an unmarried girl under fifteen years of age.

In the great majority of cases the chief distress produced in the operation was the pricking of the skin by the needle carrying the solution. Several years ago I first recommended the use of nitrous oxid analgesia to give the patient relief from this distress, and it has been a very satisfactory adjunct. I advise this combination because it is generally advisable to make a large incision in the abdominal wall in order to expose the separated recti abdominis muscles for the purpose of making a satisfactory closure of the wall at the end of the operation. The infiltration of the parietal peritoneum at the site of incision cannot be too strongly urged. A self retaining retractor is then placed in the abdominal incision, which is stretched widely as far as necessary. The anterior wall of the uterus is thus exposed. If the patient is nervous and strains at all so as to force omentum or intestines down from above, a long strip of prepared gauze soaked in warm saline may be inserted between the abdominal wall and the upper part of the uterus. If the patient be quiet, this is not usually necessary. Two ampules of pituitrin are then injected into the wall of the uterus. When blanching and hardening of the wall begins to be well established, a vertical incision about five inches in length is made in the upper part of the

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anterior uterine wall as near the middle line as possible. This is carefully carried down to the amnion, which immediately bulges through the opening. An assistant is instructed at this stage to press the abdominal wall against the uterus and to keep up this pressure during the emptying of the organ. This insures that very little amniotic fluid escapes into the peritoneal cavity.

The amnion is opened, a hand is introduced to grasp the breech of the fetus, and the latter is extracted and given to an assistant after division of the cord. This extraction sometimes causes the mother distress when undue force is used in turning or delivering the infant. In such a case, the nitrous oxid-oxygen mixture gives rapid relief. The uterus now rapidly retracts and frequently the placenta is partly expelled through the incision. The hand should be introduced to peel it and the membranes from the greatly reduced area of the wall. If the cervix be undilated, as in many primiparæ, it may be opened by uterine dilators passed into the uterus through the uterine incision. This allows of drainage from the uterus.

The intestines should now be carefully covered with a saline gauze pack and the uterine incision closed. The latter is, of course, smaller than before the removal of the child owing to retraction of the musculature. The broad surfaces of the incision are apposed by several layers of continuous iodized catgut and the peritoneal edges of the surface turned inwards. The gauze is then removed from the peritoneal cavity and the parietal peritoneum closed with iodized catgut. Through and through strong braided silk sutures, made non-capillary by rubber infiltration, are passed through skin, anterior sheath layers and recti muscles. The anterior sheath layers are approximated with iodized catgut, the skin edges brought together with fine silk or linen, and the large silk splint sutures tied last.

As a rule, the effects of the novocain first infiltrated in the abdominal wall is sufficiently marked to allow this suturing to be carried out without distress to the patient. If she complains, relief is given by the analgesic administration of the nitrous oxid gas and oxygen.

It is to be noted that I made no mention of using a local anesthetic in the uterine wall. This is entirely unnecessary. Incision of the body of the uterus causes no pain. If, however, it is necessary to perform any work in connection with the ligaments of the uterus or with the adnexa, pain may be caused and it is advisable to use novocain infiltration or gas and oxygen analgesia. It may be interesting in this connection to recapitulate the observations published by me years ago, based upon studies made on cases in which I performed abdominal section without an anesthetic of any kind. These were practically identical with those made independently and unknown to me at the time, by the late Dr. Lennander of Upsala.

The abdominal wall is sensitive in its entire extent. The parietal peritoneum everywhere in particularly sensitive, whether it be pulled, sutured, cut or pinched. Separation of adhesions between any structure and the parietes causes pain, save when the adhesions are very slight.

The visceral peritoneum is, in general, insensitive. Separation of adhesions between viscera or between them and new growths causes no pain except probably when traction is made on ligaments or mesenteries. Ligation, division or cauterization of the omentum is not noticed by the patient. If it be forcibly pulled downward, distress is caused. Similarly, the intestines are insensitive, but if they are handled so that their mesenteries are stretched, pain is caused.

Removal of the vermiform appendix causes no distress, except when adhesions between it and the parietes are separated or its mesentery is stretched. Compression, ligation or division of the broad ligaments causes pain.

Incision, suturing or cauterization of the uterus is usually not noticed by the patient, but she complains when the organ is pulled forcibly so that its ligaments are stretched. When the adnexa are adherent to the pelvic wall, separation causes distress; but gentle manipulation of them is usually unnoticed. When the ovary is squeezed, cut or sutured, distress is usually caused. Separation of the bladder from the uterus produces little or no distress. Division of the wall of the vagina in an hysterectomy causes pain.

Sponging of the visceral peritoneum is painless, whereas the same procedure applied to the parietes causes distress varying according to the degree of force employed.

The pain caused by the removal of a gauze pack from the abdomen is probably due either to irritation of parietal peritoneum or to traction on some portion of mesentery. Slow injection of hot normal saline solution (105°-108° F.) usually is not distressful. When, however, the abdomen is unduly distended, the patient complains.

Pain felt within the abdominal cavity in disease or operations, as stated by Lennander, has to do with parts innervated by the intercostal, lumbar

and sacral nerves, *i. e.*, the diaphragm, the abdominal parietes and those viscera which are innervated to any extent by these nerves, or are in near relation to them.

In recent years I have performed more than sixty conservative abdominal Cesarean sections, either entirely under local anesthesia or with the aid of nitrous oxid-oxygen analgesia. In every case mother and child survived. As regards the former, I cannot claim that this is a better record than that obtained when I employed chloroform or ether, for during that period I never had a maternal death. Indeed, in my twenty-eight years of practice, I have performed the conservative operation about one hundred and seventy times without losing a mother. As regards the child, three deaths belong to the chloroform-ether period. Two of these were premature, the other had defective heart. In a good many cases the babies did not breathe when delivered and were restored only by artificial respiration and stimulation.

In the series of operations under local anesthesia, the baby breathes very soon after delivery in the majority of cases. In conditions of eclampsia, however, and in a very few cases where no cause was evident, artificial respiration was necessary.

There can be no doubt that as regards the *fetus in utero,* Cesarean delivery by local anesthesia causes the least disturbance. Next in safety is local anesthesia with nitrous oxid analgesia. Next is ether, while chloroform stands last. The effects of chloroform, ether and nitrous oxid *on the fetus in utero* have been thoroughly studied in Rush Medical College by Graham, Woodyatt, Sansum and Henry Davis, and their findings are of great value.

While in recent years we have strongly advocated the use of nitrous oxid as a means of reducing the suffering caused by labor, we do not claim that this agent is free from risk to the fetus. Long-continued free administration of this gas may be dangerous, probably because of interference with cell oxidation. However, our use of the gas in labor does not imply an approach to this dangerous standard. The gas should be given with oxygen when possible, and only the slightest dosage is necessary to obtain analgesia. Deep anesthesia is not needed except in the delivery of the head through the vulva. Between labor pains the gas is not given and the patient quickly recovers from the very slight asphyxiation produced by the period of analgesia.

104 S. MICHIGAN AVE.

HIGH PRESSURE ANESTHESIA FOR CAVITY PREPARATION.

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The handwriting is on the wall; the admonition is to prepare, for the public is beginning to demand less pain in the dental chair. The urgency, the wisdom, the necessity for the *slacker* to adopt one or several of the means at hand for the prevention of pain is rapidly becoming more and more acute. "Man must progress or he is certain to retrogress," is a simple statement of undeniable truth particularly applicable to members of the dental profession. The vulnerable and absorbing point with the person in need of dental service is always the dread of being hurt. The dentist is well aware of this fact, even more so than the public. Glib and voluminous as has been the sum total of what has been spoken and written on the subject, yet only a mere residue of doubtful generalities is probably left in the mind of the busy practitioner in pursuit of information. This may be a plausible excuse in many instances for the lack of interest on the subject; however, the impressive statement of the Hon. George A. Post, the president of the Railway Business Association, New York, may be *apropos* of the situation: "We are not acquainted with the coward who could venture nothing, the penurious who would spend nothing, the indolent who would do nothing, the critic who carps at everything that does not originate with him, and the visionary who bawls loudly for the instant approval of anything he thinks he thinks."

The compressed-air obtunder or any other of the present types of high-pressure syringes will never become popular with the average practitioner; the technic is the restraining factor. Not that the rank and file do not possess the mental faculty for mastering the technic, but they will not do so.

VARIOUS METHODS SHOULD BE STUDIED.

Of all the appliances and methods for the relief of pain in dental operations, none are perfect or nearly so, but each possesses certain merits not found in others. For this reason the operator should understand more than one method. Before giving the advantages of the high-pressure syringe method, certain statements on other methods by men of national repute will be given.

NITROUS OXID ANALGESIA.

The following quotation, taken from recent dental literature, was made by a nitrous oxid analgesia enthusiast: "The diet preparatory for nitrous oxid analgesia should be the same as for anesthesia, viz., a fasting condition for three hours. . . . The patient most sure to bring failure is the one who is accustomed to the use of strong drink as a matter of habit. . . . Patients addicted to the use of drugs, either as an uncontrollable habit or as a medical treatment, will be found to be unreliable. . . . Patients who make no effort to co-operate with the dentist, due to inability or refusal to exert will-power, will be found unsatisfactory; suggestion in these cases avails us nothing, for the reason that the patient will not dwell upon our statements."

CONDUCTIVE ANESTHESIA.

Speaking of the pterygo-mandibular injection in conductive anesthesia, one writer states, "Anesthesia occurs in from fifteen to twenty minutes." Under the heading of "After-effects," the same author informs us that—"There are swellings which disappear without treatment and possibly pain from the above sources or from infection during or after the operation."

Referring to intra-osseous, infiltration, and conductive anesthesia, another dentist comments on certain physiological symptoms. This writer's remarks are similar to those made by others: "Seventeen showed decided symptoms of intoxication to a greater or less degree. . . . Only two lapsed into a state of coma."

With the numerous reports of satisfactory results of pain-saving procedures other than the high-pressure

syringe method, any attempt to detract from their excellence would only bring deserved ridicule; there is no intention to depreciate their worth—and I may say here that I do not rely wholly on compressed-air obtunder. Preliminary preparation, such as diet and loosening of tight clothing, are not necessary in high-pressure anesthesia. Alcoholics and drug-fiends respond to treatment as quickly and as readily as obstainer. A reassuring talk to gain the patients' confidence so that they will make an effort to assist the operator by a concentration of will-power is entirely unnecessary. It is only necessary to display the obtunder and inform them that the flat needle-point will be held against the tooth until a sufficient amount of the anesthetic is absorbed to enable the operator to perform the work in hand painlessly. The operator can assure the patient that there will be no pain at any time, either in using the obtunder, in operating, or following the treatment. There is no waiting for the anesthetic to be absorbed, as in conductive anesthesia, and excavating may begin immediately after using the obtunder in from thirty seconds to two minutes. As to physiological symptoms and after-effects, there are none.

Fig. 1.

The syringe.

DESCRIPTION OF THE SYRINGE.

The compressed-air obtunder provides a positive means of furnishing a consistent pressure without special effort on the part of the operator. The working parts of this instrument are made of correct mathematical size so that, with a source of air-pressure of forty pounds, a pressure of three thousand pounds to the square inch can be produced in the liquid-chamber of the syringe. A cross section of the opening in the needle-point, which is of No. 22 gage, measures only an infinitesimal fraction of a square inch, therefore very little effort is required to hold the obtunder against the tooth, merely the weight of the instrument being almost sufficient to give close contact.

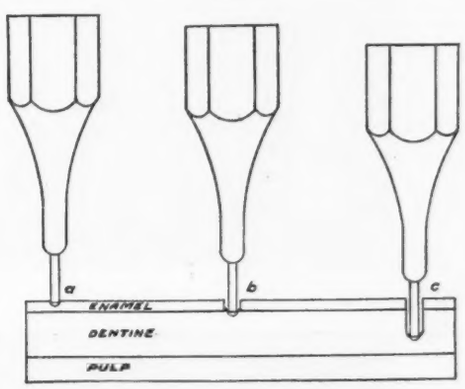
PREPARING THE POINT OF INJECTION.

Fig. 2 represents the three stages in preparing the pit and desensitizing the dentin. A sharp No. 1 round bur is selected and the enamel is cut into about one-half or a little more of the depth of the bur's head, forming a miniature hemisphere. This initial pit is best started by holding the bur with its long axis parallel to the surface of the tooth rather than at right angles, as the bur cuts much faster when held in this position. The rubber dam is unnecessary unless otherwise needed for the work in hand. Having previously drawn the anesthetic into the obtunder and warmed it to about body temperature by holding the liquid-chamber over a flame, grasp the knurled barrel in the right hand (Fig. 1) and use the thumb to manipulate the cut-off. The needle-point is then placed in the pit (Fig. 2, *a*), and gentle pressure is exerted with the hand, using a slightly rotating motion. The air is allowed to enter the obtunder slowly. When the finger-lift comes to a stop, it indicates that the tooth is receiving full pressure. The instrument is held in this position for precisely twenty seconds—not guessing at the time. The seconds should either be counted or timed with a time-piece. The injection will then be driven between the enamel rods and into the dentin. A slight leak of the anesthetic around the needle-point or the escape of a small amount of air from the air-chamber will not retard the effectiveness of the anesthetic.

LIQUID-TIGHT CONTACT NECESSARY.

The discouraging factor to the beginner in high-pressure anesthesia is the inability to always have the contact between the tooth and the needle-point liquid tight, but this readily becomes the simplest part of the procedure after some practice. If a leak occurs it may be due to one of several causes; either the pit is imperfectly formed, or the needle-point is worn, or its margins broken so that it is not perfectly round. Or perhaps the engine hand-

Fig. 2.



piece was not held steadily, or a worn bur was used, in which case it is impossible to form a pit absolutely symmetrical in outline. The flat end of the needle-point should form a perfect right angle with the outer cylindrical surface of the pit—the needle-point must be square, and not rounded. This may be secured by dressing down the point with a cuttle-fish disk. Indeed, this little precaution had best be taken after every three or four cases. The operator may at times resort to the use of a few cotton fibres between the needle and pit, but this is seldom necessary.

The next step is to enlarge the pit with a No. 3 round bur, and deepen it down to the dentin. If the enamel is thin, as it is near the gum margin, do not change burs With the No. 1 bur make a depression in the enlarged pit to receive the needle (Fig. 2, *b*). The obtunder is now applied for fifteen seconds. This injection is largely in the nature of a precautionary measure, to make sure that there will be no pain when the dentin is penetrate dfarther with the bur. The pit is finally deepened to two-thirds of the distance to the pulp, and again countersunk with the small bur (Fig. 2, *c*).

APPLYING THE ANESTHETIC.

The time allowance for the use of the obtunder at this stage depends principally on the tooth being treated, although the age of the patient should be considered—the older the patient the longer the time required to desensitize the tooth. Of course in youth the pulp is large and the dentinal tubules more adapted to receiving the anesthetic, while in older patients there are deposits of dentin,

perhaps *curly* dentin, making anesthesia more difficult, and demanding more time to force the anesthetic into the pulp. For a person, say, thirty years of age, forty-five seconds should be allowed for lower incisors and upper laterals; one minute for upper central incisors, canines, lower bicuspids, and upper second bicuspids; one and one-half minutes for upper first bicuspids, and two minutes for molars. The lengths of time given should be doubled if the pulp is to be extirpated. Should there be any escape of the solution from around the needle-point in the final application of the instrument, it may be assumed that the pit is irregular in outline. It is a simple matter to straight the walls with a spear-point, dentate, or fissure bur.

LOCATION OF THE POINT OF INJECTION.

The pit should be included in the finished cavity, but should not be disturbed until the balance of the cavity is prepared, as there may be some sensitiveness remaining that would necessitate further use of the obtunder. As the enamel walls become thinner toward the cementum, it is easier to make the pit near the gingival line. The best results are obtained by making the pit in healthy dentin near the injunction with the affected area. The point of injection should be made at the most accessible point in the cervical portion of the tooth when preparing a tooth for a crown abutment. If a pulp extirpation is desired in the case of a badly decayed molar in which the pulp is almost exposed, the most accessible point at which to use the obtunder is possibly within the cavity itself, removing the soft decay about a millimeter from a pulp cornu, and making the pit at that point.

Sometimes the cervical point of injection is not practicable. In such a case make a pit over a cornu of the pulp on the morsal surface. Start the bur next to but not in the fissure through which the cavity is to be extended, directing the bur toward the cornu after reaching the dentin. The pit in this case also should be included in the finished cavity. The dots on the teeth in Fig. 3, A and B, indicate the different points at which the injection can best be made.

The simplest cavity and the easiest to obtund is the gingival cavity, notwithstanding the fact that such cavities are the most painful to prepare if the tooth is not desensitized. This type is shown in Fig. 4, A, B. In the upper

(Continued on Page 134.)

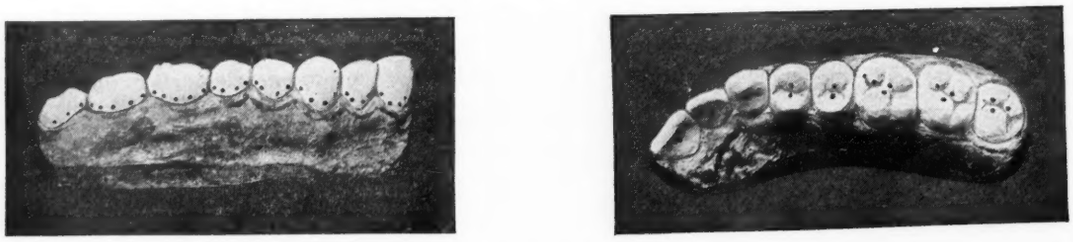
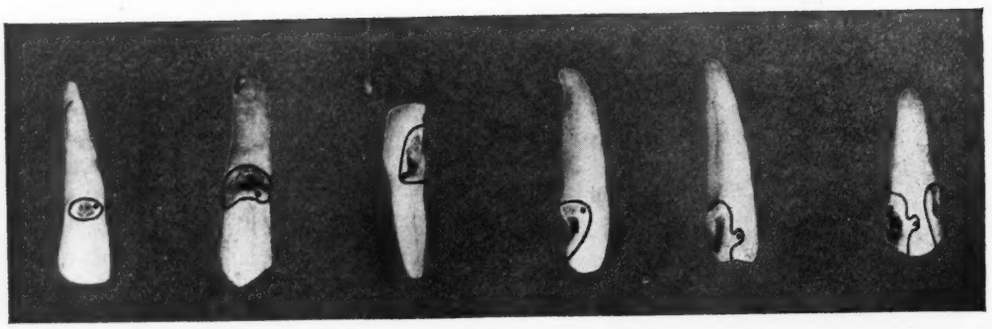
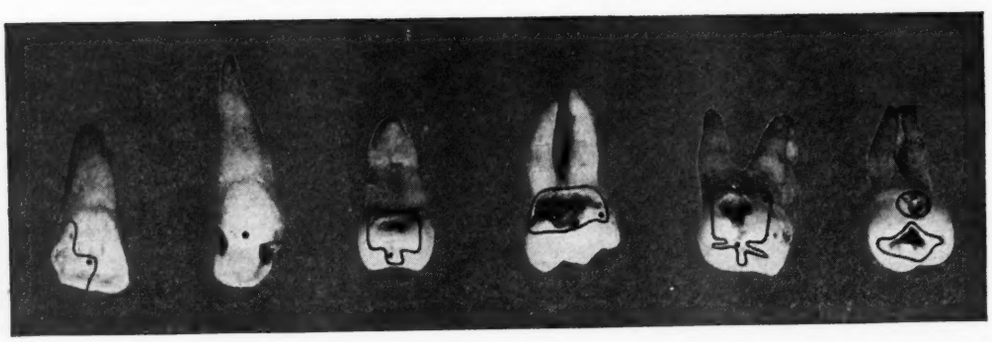


Fig. 3—A and B.

Fig. 4.



A B C D E



G H I J K L

ANESTHETICS USED.

As such a small amount of the anesthetic actually enters the pulp—one-sixth of a drop is the estimate—a two-per-cent. solution of cocain is perfectly safe. However, should the operator have an aversion to cocain, the novocain-suprarenin tablets *E*, containing novocain 0.02 gram and suprarenin 0.00005 gram in a two-per-cent. aqueous or normal salt solution, may be used. If through carelessness an overdose of the anesthetic is given, causing a strangulation from which the pulp does not recover, death of the pulp may be the result. But this contingency is as remote with the careful operator as that of the physician causing the death of a patient by an overdose of a drug. There is never any danger of having injected too much of the anesthetic if the dentin is still sensitive. This condition merely indicates the lack of a sufficient amount of the anesthetic.

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F. HOEFFER McMECHAN, A.M., M.D., *Editor*

Avon Lake, Ohio, U.S.A.

OCTOBER EDITORIALS. 1918

THE MEDICAL RESERVE CORPS; THE VOLUNTEER MEDICAL SERVICE CORPS AND RED CROSS.

If you are not yet doing your bit and your best and are qualified for active medico-military service, the Editor of the Supplement will be glad to cooperate with you in speeding-up your application for a commission in the Medical Reserve Corps.

If you are physically disabled, over-age, essential to public or institutional need or have dependents who cannot be left, the Volunteer Medical Service Corps offers you an opportunity for accomplishing something worth while in the present emergency. Write to Dr. John D. McLean, Acting-Secretary of the Central Governing Board, Council of National Defense, Washington, D. C., requesting a formal application blank. Fill it out with your special qualifications and cooperate in Winning the War.

Major A. Lambert has issued a call from Paris for medical men to enter the service of the Red Cross abroad. Only those disqualified for service in the Medical Reserve Corps are desired. If Red Cross work interests you write to Dr. A. E. Shepley, Medical Personnel Bureau, Red Cross Headquarters, Washington, D. C., and find out what you can do.

Should any difficulty arise in securing service the Editor will try and obviate it if you will let him know.

Accompany your application for active service with an endorsement from your Association of Anesthetists. The secretary will gladly send you one on request.—McM.

GIVING OF ANESTHETICS CONSTITUTES THE PRACTICE OF MEDICINE IN WEST VIRGINIA.

An opinion recently handed down by the Attorney General of West Virginia holds that the giving of anesthetics constitutes the practice of medicine and that no person, nurse or otherwise, can legally administer anesthetics, unless he or she is duly licensed to practice medicine. The vital portion of the opinion is as follows:

"Under the law, the right to administer drugs used in surgical anesthesia by a person not a licensed physician would not depend upon either the question of preparation by study or otherwise, or compensation or fees charged for service, but upon the question as to whether or not the administration of such drugs would constitute the 'practice of medicine and surgery' within the meaning of the statutory definition. Is the administration of the anesthetic preparatory to a surgical operation an integral part of the operation itself? I think it is. There are certain things preparatory to a surgical operation necessary to be done that can be trusted to nurses and attendants, which are really not a part of the operation itself, and require no great amount of skill to perform. However, an anesthetic is a substance, the unskilful handling of which is dangerous to human life. The person undergoing the operation places himself absolutely under the control of the person administering the anesthetic. This is the first dangerous step in the operation; the first one requiring peculiar skill and knowledge. The operating surgeon concentrates his attention on the cutting part of the operation and cannot well exercise careful supervision over the person administering the anesthetic. The anesthetic is such a subtle and dangerous agent that the most careful supervision on the part of the operating physician does not remove the danger of the anesthetic in the hands of an unskilful person.

"If it is held that the administration of anesthetics does not constitute the 'practice of medicine and surgery, then the fitness of a person to administer them is determined in each case by the operating surgeon. He would constitute the examining tribunal and might choose either a skilled or unskilled person to perform a recognized dangerous part of the operation. I do not believe the legislature ever intended that any person not a

licensed physician should be permitted to administer drugs used in surgical anesthesia, even though such person may act under the direction and in the presence of a licensed physician and surgeon."

From this opinion it appears that under no circumstances can any person, whether trained nurse or otherwise, administer an anesthetic during a surgical operation unless such person has received a license entitling him or her to practice medicine and surgery.

HIGH PRESSURE ANESTHESIA FOR CAVITY PREPARATION.

(*Continued from page* 132)

lateral, A, the affected area probably would not extend to the gum. This would allow sufficient space for the injection to be made at a point between the cavity and the gum margin. As the enamel is quite thin at this point, precaution should be taken not to go too deep with the No. 1 bur before the first injection, as the dentin is readily reached and pain would be caused. In the case of the upper canine, B, the decay would generally extend beneath the free margin of the gum, and it would be necessary to make the pit to the mesial, distal, or morsal of the carious portion. The lower right central, C, may best be obtunded at the labio-mesio-gingival angle.

SINGLE INJECTIONS FOR TWO CAVITIES.

When an approximal and a labial cavity occur in the same tooth, D, the injection for the labial cavity will suffice for both. It is always necessary to force the anesthetic into the pulp for any cavity unless the cavity is extremely small—less than pinhead size, therefore at least the crown of the tooth should be anesthetized, and any number of cavities in it may be prepared or the tooth prepared for crown painlessly. It is usually most convenient to use the obtunder directly over the pulp on the lingual surface when it is deemed advisable to prepare an L cavity or make a lingual retention, E, F. Where there is a large cavity and exposure of the pulp, high-pressure anesthesia is not indicated, and the ordinary hand-pressure anesthesia method should be employed. Considerable cutting is usually necessary to prepare a cavity for a filling or an inlay where a corner of a crown is broken off, G, particularly if the morsal surface is well worn and the bit is short. A very secure anchorage is necessary in such a case, for the reason that in these cases much stress will be brought to bear on the filling in the mastication of food. Much cutting means much pain, but the pain is easily eliminated by the use of the high-pressure syringe.

In a badly disintegrated tooth, H, either a crown or filling may be indicated. If the pulp is found vital—and always ascertain whether or not it is devitalized—and a crown is indicated, the point selected for anesthetizing should be on the labial surface; but if fillings are indicated, the pit should be at the mesio-labio-gingival angle, the disto-labio-gingival angle, or on the lingual surface over the cingulum. In the case of a bicuspid or molar having an approximo-occlusal cavity, I, K, the needle is best inserted close to the gingival line adjacent to the infected area. If this point be difficult to reach, the morsal surface may be chosen. There is no unnecessary waste of tooth structure if Black's extension for prevention principles are conscientiously followed.

Lastly, in the case of a carious molar, in which there is both a morsal and a buccal cavity, L, it is another case of "two birds with one stone," and one injection on the buccal surface as indicated is sufficient to desensitize the tooth for the preparation of both cavities.—*Dental Cosmos.*

ANESTHESIA IN WAR SURGERY

ANESTHETICS IN MILITARY HOSPITALS.

THOMAS CLARKE, M. R. C. S., L. R. C. P. (Lond.)
Temporary Lieutenant R. A. M. C.
Anesthetist to the Lord Derby War Hospital and the Victoria Hospital, Burnley.

Having now been administering anesthetics for several years in hospital and private practice and daily for the last seven months at the Lord Derby War Hospital, Warrington, with 3,000 beds in the summer and 2,500 in winter, the following is my experience:

The patient is given as a preliminary morphin ¼ grain, atropin 1/150 grain, half an hour before the operation. The preliminary injection of morphin and atropin is not only followed by less secretion of mucus and a quieter anesthesia, but the patient usually sleeps for an hour or two after the operation, thus causing very much less trouble to the nursing staff—a great advantage in a busy hospital.

The anesthetic mostly used by me is ether, preceded by chloroform. I use two separate masks, one covered with a layer of lint for chloroform and the other with two layers of lint for ether. By using two separate masks the danger of giving a mixture of unknown strength is avoided, and I almost invariably use the open ether drop method on a Schimmelbush's mask.

At the beginning of the administration I drop about one drachm of chloroform slowly on the mask, holding it an inch or so from the patient's face and quietly talking to him, or in nervous cases getting him to count. During this time the mask is lowered, until in about a minute or so it is resting on the face. I then replace it by the ether mask and quickly drop on ether till the lint is saturated. Next I place a towel, two or three folds, over the mask to increase the concentration, leaving sufficient space to apply the anesthetic continuously. By this method I rarely get any struggling and often not the slightest movement on the part of the patient, who is generally ready for the operator in three or four minutes. This ensures the maximum degree of safety, is certainly very quick, and preferable to beginning with ether alone. Patients all agree that the chloroform is pleasanter and less irritating. For instance, it is quite the rule for those men who have had both anesthetics to tell me that they prefer chloroform. The average quantity of anesthetic for an operation of half an hour is 2 drachms of chloroform, 3 oz. of ether. Occasionally it is very difficult to keep some of these young subjects under with the ether drop method alone, especially in abdominal cases, and it may be necessary to resort to a little chloroform or C. E. mixture for a short time and then resume the ether.

In my private and previous hospital experience I have administered nearly three thousand anesthetics, the bulk by the method outlined, and have not had one fatal case or any serious difficulty.

In my early days I was taught to give ether by the Clover method, but now rarely use it, for to my mind the ether drop method is very much better, in that the patients very rarely get cyanosed, have less trouble with mucus, a quieter anesthesia, and less sickness after the operation.

I have also introduced a Shipway's warm ether apparatus, and, in conjunction with my own methods, find it very useful in cases requiring prolonged administration, in that it conserves the body heat of the patient, and is also a saving of the anesthetic.

Ethyl chlorid and nitrous oxid have proved quite satisfactory for patients requiring a short anesthesia such as for incisions and manipulation of joints.

I find, after giving anesthetics daily in a military hospital, that it is quite different from administering them in a general hospital in peace. In the latter it is the exception to have a strong, healthy young man to anesthetize, the majority of cases being women and children or men usually with a definite organic or inflammatory lesion and often well prepared for an operation. Military cases are frequently robust young men who have lived an outdoor life for varying periods and many of them have been in the trenches and subject to war strain and nervous exhaustion. I have also found that men suffering from shell shock require much more anesthetic than other men and have a greater tendency to excitement whilst going under. In these cases a little encouraging suggestion during the first stage of anesthesia not only helps during the administration, but is also beneficial afterwards. At first I was inclined to attribute this to the mode of living, which made them difficult to anesthetize, but I am now convinced there is a nervous element to contend with. It is impossible in many cases to judge by the appearance of the men how they are likely to behave under an anesthetic. Some of the apparently quiet and sickly-looking men take a large quantity of anesthetic and become troublesome with excitement, whereas some of the rough-looking and vigorous need very little.

SPINAL ANESTHESIA IN WAR SURGERY.

Meuriot and Platon expatiate on the advantages of the spinal technic in operating on the legs and especially on the pelvis when the patient has to lie face downward. The war has led to the adopton of this technic more and more; Pauchet now has a record of over 2,000 operations done with spinal anesthesia, and they prefer the latter for all operations below the tenth pair of dorsal nerves. There is no vomiting with it, as they apply it, and no period of agitation as the patient rouses. The latter feature is particularly advantageous when a cast has to be applied and we have to wait for the plaster to set. Of course the anesthetic is a poison, and those whose liver and kidneys show that they are unable to counteract the toxic effect of the anesthetic should be excluded from spinal anesthesia. The wounded in war, however, are generally young and in good health, and hence evidence of toxic action from the anesthetic is very rare. They encountered it only in three of their 240 cases, and the manifestations were slight and transient. Two in this group of three were officers over 50, and the other showed signs of insufficiency on the part of the liver. In peace times, little attention was paid to insufficiency of the liver and kidneys as contraindicating spinal anesthesia and this explains the dissatisfaction with it. In operations on women soon after and during pregnancy and in persons over 50 the liver is apt to be below par. Even with the healthy young men of the army there are liable to be symptoms showing secondary excessive pressure (vertigo and headache) or indicating slight toxic action on the bulb (cold sweat, vomiting, syncope). But it is possible to ward off all this by care to withdraw enough of the cerebrospinal fluid to reduce the pressure. This may be estimated without an instrument of precision, but with the manometer it can be accurately determined, and the spinal anesthesia can proceed without fear of hypertension. They always make the injection with the patient seated, and they wait for three or four minutes before they let him recline, thus giving the anesthetic time to settle on the lower roots, and when he reclines they keep the head and shoulders raised on pillows to prevent diffusion of the drug to the brain. They always use the same solution, 0 07 gm. stovain in 2 c.c. of artificial serum, and draw 1 or 2 c.c. of the spinal fluid into the syringe and mix it well until the stovain acts on the albumin in the spinal fluid, as showed by slight turbidity.—(*Jour. A. M. A., Feb.* 23, 1918.)

Leclerc says procain spinal anesthesia has three advantages: (1) it facilitates the change of the patient's position on the operating table and easily permits abdominal decubitus; (2) there is preservation of the largyngeal reflex which prevents asphyxia and postoperative bronchopneumonia; (3) in parotomy it avoids the thrust of abdominal viscera; (4) dimunition or suppression of operative shock is the principal advantage.

The disadvantages are: (1) for some reason or other there may be a complete failure to effect anesthesia; this is, however, very rare; (2) the anesthesia may be insufficient as regards intensity or duration or extent of field.

To justly appreciate lumbar anesthesia and the importance of the checks to which it is subject, it is necessary to carefully consider the dosage employed, the operative technic, and the points of injection, and the region in which the operation is to be done. As regards dosage the author employs three categories, i.e., less than 10 cg., 10 cg., and from 10 to 15 cg., the latter figure representing the maximum used; but the efficacy of anesthesia does not depend on the strength of the dose, as experience has shown that in some cases the stronger the dose the greater the proportion of failures.

The site of injection is the first or fifth lumbar space. The author uses both equally well. The higher level not effected by anesthesia differs for each patient and is not in agreement with the quantity injected. The most suitable level for spinal anesthesia seems to be the first lumbar or the twelfth dorsal space.

As complications, there may be slight nausea or vomiting or headache. In one case there was deafness and labyrinthine phenomena; in 6 cases rachialgia and meningitis; in 2 cases some strabismus. All these disappeared in the course of time.

Spinal procain anesthesia, though not a method of absolute security, renders great service, especially in cases of shock and wounds of certain regions.—(*Lyons Chir.* p. 497, 1917.)

LUMBAR ANESTHESIA IN THE TREATMENT OF SCIATICA IN MILITARY HOSPITALS.

Mancini remarks that the conditions at the advanced front amply explain the large number of cases of sciatica that are found constantly in the military hospitals. Treatment is mainly restricted to local injection of phenol, baths and electricity but the disturbances soon return as a rule after any or all of these. He has obtained much better and more durable results by inducing lumbar anesthesia. He injects 12 or 15 cg. of a 5 per cent. solution of procain, introducing the needle in the third or fourth lumbar intervertebral space The relief of pain is immediate and complete. The anesthesia lasts from forty-five minutes to two hours. This brings the anesthetic into direct contact with the roots of the injured nerves, as well as with their connections with the spinal cord The relief from pain is more complete and more durable than when the anesthetic is injected into the spinal cavity. The anesthetic seems to have a favorable action likewise on motor and trophic disturbances. He has applied this treatment in pure sciatica and also in cases of pain in the sciatic and ischium region from disease or injury by a projectile. Of course the benefit is durable only in the absence of anatomic lesions along the sensory nerve, but even these seem to be favorably modified to a certain extent. Any anesthetic might do, but procain or its equivalents have certain advantages. He adds a minute quantity of epinephrin to the anesthetic. In one case he injected by mistake nearly twice the intended dose of the anesthetic, but no harm resulted.—(*Riforma Medica, June* 1, 1918.)

Book Reviews

Local and Regional Anesthesia, Including Analgesia. By Carroll W. Allen, M.D., of Tulane University, New Orleans, with an Introduction by Rudolph Matas, M.D. Second Edition, Reset. Octavo of 674 pages, with 260 Illustrations. W. B. Saunders Company, Philadelphia and London, 1918. Cloth, $6.50 net.

During the three years that have elapsed since the appearance of the first edition of Allen's monumental work on Local and Regional Anesthesia, considerable improvement and progress have been made in the field of painless surgery.

With a general broadening of this field, many additional

operations have been added to the already long list of those commonly performed by surgeons skilled in the use of methods of local and regional anesthesia. Notable among these additions is the removal of the prostate, a subject but briefly touched on in the first edition, and more recently considered in detail in the American Year Book of Anesthesia and Analgesia (1915-16), and now comprehensively considered. Allen regards the removal of the prostate as his best accomplishment in local anesthesia, largely on account of the great reduction in mortality and the ease by which the operation is done under the perfected technic of local anesthesia.

This second edition presents a great deal of new matter regarding sacral anesthesia which is coming into its own as a very valuable method of obtunding the pelvic areas. Hertzler, Lewis, Lynch and others have given great impetus to its use and it has been found very satisfactory. Many practical additions to technic for abdominal surgery are also included.

Cushing, after his experience at the front, has concluded that local anesthesia is the preferable method for all operations on the head and brain. Consequently, the progress collated by Allen in the chapter on local anesthesia for operations on the head will be found very useful.

So much has also been accomplished in perfecting spinal anesthesia that Allen has rewritten this chapter in line with the results of recent researches and clinical achievements.

In the preface to his second edition Allen remarks very pertinently: "Every change is not always a reform, and apparent triumph is not always progress. There is often work that must be done without enthusiasm, work that brings unrelieved weariness and a plodding gait, but the direct value of what we do is that we are working in the direction of progress. This has been my inspiration, and with these thoughts in mind I send this edition to press."

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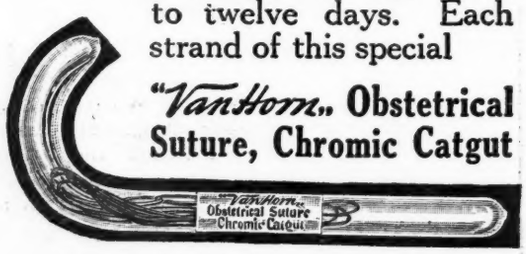

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As a means of emptying the tissues of accumulated fluids in dropsical conditions ANEDEMIN has gained wide vogue among practitioners. In cardio-renal disease ANEDEMIN acts by steadying the heart, adding to its propulsive force, and increasing the renal function through its diuretic effect. This double influence of ANEDEMIN makes it an agent of pronounced worth in all dropsical states, in which it is the therapeutic agent of first choice with many able practitioners. ANEDEMIN is a well balanced preparaton, and he who employs it may know that he is using a well tried combination of drugs in dropsical effusions.

ANEDEMIN is with druggists—in tablet form chocolate coated and packed in sealed tins of 100's—costing the dispensing physician and hospital $1.50 per 100 or five 100's $6.50. By wholesale or Retail Druggists prepaid. Can be shipped mail C. O. D., no extra cost.

Advertised to the medical profession exclusively. Samples with literature and clinical data sent physicians on request.

To test Anedemin, Doctor, would convince you of its extreme power in dropsies and its real worth for the cause—it strikes at the very root of the trouble and removes the cause, of anasarca, rather than its results.

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Manufacturers of Anedemin.

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LYMAN BROS. CO. (Agts., Canada)
Toronto, Ont., Can.

INSURANCE AGAINST INFLUENZAL COMPLICATIONS

is to be secured by charging the tissues with added resistance. The gravity of "Spanish" Influenza lies in the pulmonary complications. Codliver oil as presented in

offers an effective means of quickly putting increased resistance into susceptible tissues, thus guarding against dangerous pulmonary complications.

EVERYTHING THAT COD LIVER OIL IS EXCEPT DISAGREEABLE

Easily Assimilated

EACH FLUID OUNCE OF HAGEE'S CORDIAL OF THE EXTRACT OF COD LIVER OIL COMPOUND CONTAINS THE EXTRACT OBTAINABLE FROM ONE-THIRD FLUID OUNCE OF COD LIVER OIL (THE FATTY PORTION BEING ELIMINATED) 6 GRAINS CALCIUM HYPOPHOSPHITE, 3 GRAINS SODIUM HYPOPHOSPHITE, WITH GLYCERIN AND AROMATICS.

Free From Grease and the Taste of Fish

Supplied in sixteen ounce bottles only. *Dispensed by all druggists.*

Katharmon Chemical Co., St. Louis, Mo.

KATHARMON *used as a nose and throat wash keeps the naso-pharyngeal passages clean and reduces the possibility of influenza infections—Four times a day—the results are worth the effort.* Katharmon Chemical Co., St Louis Mo.

KATHARMON represents in combination Hydrastis Canadensis, Thymus Vulgaris, Mentha Arvensis, Phytolacca Decaadra, 10½ grains Acid Borosalicylic, 24 grains Sodium Pyroborate to each fluid ounce of Pure Distilled Extract of Witch Hazel.

A Constructive Shoe for Arch Repairing

To effect the replacement of a fallen arch experienced physicians avoid the use of rigid shanks and props, turning to the more gentle and effective flexible shank which is efficacious because of its healthful encouragement to the cramped and disused muscles.

The Coward Arch Support Shoe is designed as a constructive agent renewing the normal functions in cases where it is possible to do so. There are some patients, of course, who will require it for permanent wear. Foot muscles that have not been abused too far will respond to the help that this shoe offers.

Extension heel restores the correct balance of the body when walking and standing. The long counter, shown by dotted line, helps in reshaping the longitudinal arch.

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Sold Nowhere Else

The Coward Shoe

REG. U. S. PAT. OFF.

I-D-L Lubricant

The ideal excipient for local application of drugs.

Bland, non-irritating, antiseptic, water-soluble, soothing, cooling and healing to the skin.

DERMITIS, URTICARIA, PRURITUS, Etc.

It renders the passing of sounds, catheters, cystoscopes, etc., easy of accomplishment.

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Influenza?
Bronchial Catarrh?
Intestinal Catarrh?

There is an original and unique combination indicated for its prevention and treatment:

Kugloids

The ideal expectorant. Do not irritate the stomach, saturate the economy with their constituents, act as intestinal antiseptic.

SAMPLES SENT TO DOCTORS ON REQUEST.

E. Fougera & Co., Inc.

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"Conditions heretofore considered hopeless frequently clear up under proper treatment with internal secretions as if by a miracle, astounding and gratifying to both patient and doctor." —*Garretson.*

The "Run-Down" States

notably malnutrition, asthenia, general debility, presenility, and functional disorders in general, are invariably characterized by metabolic disorders. In these conditions the effect of

PROTONUCLEIN

(THYROID-THYMUS-SPLEEN-PANCREAS-STOMACH-SALIVARY-LYMPHATICS-BRAIN)

is often that of a specific. The internal secretory system is regulated, the nutrition is improved, and there is an increase in functional activity throughout the body. Thus Protonuclein overcomes morbid tendencies and restores the physiologic balance of the organism.

2 *A trial bottle will convince you*

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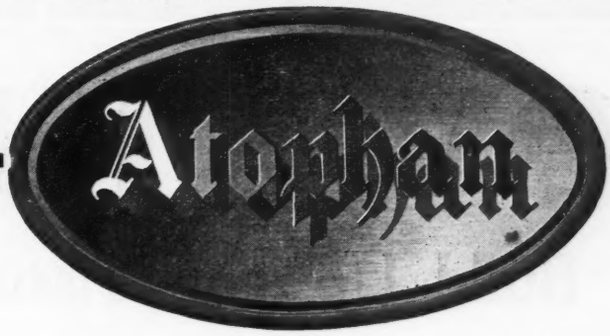

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Which stands for

Combined Efficiency and Safety

In the Relief of

PAIN, INFLAMMATION and CONGESTION

By Internal Medication.

No constipating, cumulative, cardiac depressant, or renal irritant by effects.

ATOPHAN is made in U. S. A. and furnished in

Tablets, 7½ grains, twenty in box. **Powder,** in 1 oz. cartons.

SCHERING & GLATZ, Inc., 150 Maiden Lane, NEW YORK

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Therefore, genuine Bayer-Tablets and Capsules of Aspirin as well as other Bayer products can be purchased with full confidence.

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To Build Up The Tissues

TO PUT resisting power into the tissues of the debilitated (those who otherwise would fall easy victims of Grippe, Bronchitis, Influenza and Pneumonia), it is BOVININE which is of supreme value.

Resistance against disease lies in a rich blood stream and stable nervous vigor, conditions brought about by the essential elements of BOVININE, its nucleo albumin and its iron.

Write TO-DAY for sample bottle. It will be sent free with one of our convenient Sterilizable Tongue Depressors.

THE BOVININE COMPANY

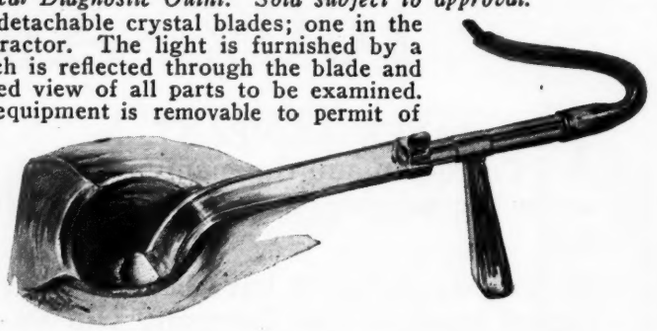
75 WEST HOUSTON STREET NEW YORK

CRYSTAL DIAGNOSTIC INSTRUMENTS

Designed by Dr. I. J. Smit, of Chicago, Illinois

A most convenient and practical Diagnostic Outfit. Sold subject to approval.

The outfit consists of metal handle and two detachable crystal blades; one in the shape of a tongue depressor and the other a retractor. The light is furnished by a 6-volt lamp in the handle of the instrument, which is reflected through the blade and radiates from the end. This gives an unobstructed view of all parts to be examined.



The handle is slotted, and each part of the equipment is removable to permit of absolute sterilization. The light is projected through the crystal oblong, from the proximal end to the distal, and thence to its field of usefulness. The amount of light lost, between the ends is negligible.

The Smit instruments are designed to aid in diagnosing pathological conditions and to illuminate parts heretofore considered inaccessible. To illustrate: THE CRYSTAL RETRACTOR will illuminate the abdominal cavity, to the extent of doing away with overhead lamps; that is of course, so far as the operation or examination may be concerned, curve the crystal under the bladder, and pathological conditions—including calculi if present are shown. Visceral and muscular adnexa are under complete observation. THE TONGUE DEPRESSOR will illuminate both mouth and throat to an extent hitherto unattainable. The Crystal Tongue Depressor carries a light—a better working light, than may be had from any lamps or mirrors yet devised, with the Smit device the laryngoscope is used without hindrance. Where a throat operation is necessary, the assistant holds the illuminating depressor and the surgeon may proceed with perfect ease.

Battery Attached

The outfit for commercial current can be operated from any Wallplate, Switchboard or Controller which will reduce the current to 6 volts. In the event you do not have this equipment, we recommend our No. 9M2818—Reducing Controller listed below, which can be connected to any 110-volt lamp socket. The Battery outfit is made on the same principle but is operated from a small dry cell enclosed in the handle of the instrument.

9M2701. Smit Crystal Diagnostic Outfit, for use on Commercial current **$10.00**
9M2703. Smit Crystal Diagnostic Outfit, battery attached **9.00**
9M2818. Rheostat Controller for reducing 110-volt current to operate outfit 9M2701..... **4.50**

***Manufactured by* FRANK S. BETZ CO., HAMMOND, IND.**

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Advancing Age

is marked by an increasing preponderance of tissue breakdown over tissue repair, which renders proper feeding a most important measure.

A well-balanced supply of the "chemical foods"—calcium, sodium, potassium, manganese, phosphorus, and iron—is essential to tissue building. And the so-called "dynamic" action of strychnine and quinine, administered in continuous small doses, impedes the progress of destructive metabolism.

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contains these elements in a uniform, palatable, stable, and easily-assimilable form. And the clinical results from over fifty years of use, bear witness to its usefulness in advancing age

Literature and Samples on request

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Physical Conditioning

So many patients, especially women, lack the initiative to follow general advice regarding exercises, dietary, and personal hygiene. Physicians acquainted with my work are constantly referring these cases to me for physical and mental "conditioning."

A woman can often inspire her sex *to be* and *to do* and *hold her to this inspiration* by regular correspondence as men cannot.

Every pupil's requirements are studied individually, and each is directed according to her needs and her strength.

This cooperative work with the medical profession is giving results highly gratifying to both physicians and patients.

I shall be glad to assist you with patients who need conditioning through exercise, diet, breathing, correct poise, reduction of flesh, or building of flesh.

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An Essential in Treatment of Fractures, Dislocations, Deformities

Shiver's Plaster

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Highly adhesive, will not yield to strong traction, cleanly and unirritating

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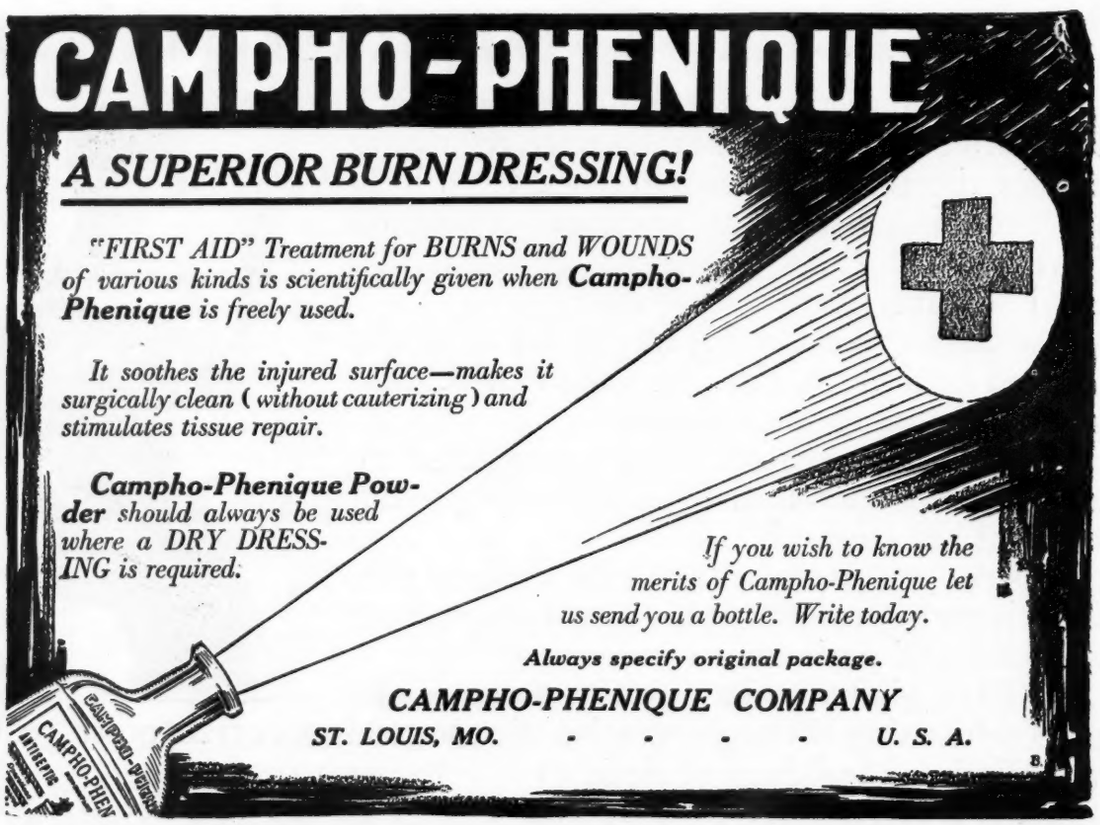
A SUPERIOR BURN DRESSING!

"FIRST AID" Treatment for BURNS and WOUNDS of various kinds is scientifically given when ***Campho-Phenique*** *is freely used.*

It soothes the injured surface—makes it surgically clean (without cauterizing) and stimulates tissue repair.

Campho-Phenique Powder *should always be used where a DRY DRESSING is required.*



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The quality as well as the efficiency of

KORA-KONIA

has been proven conclusively by the many physicians who have tested it and now use it as a dusting and dressing powder par excellence.

KORA-KONIA is absorbent, soothing, healing and has been described as 100% efficient in chafes, burns, wounds, sores, ulcers, pruritis, hives, eczema and other dermal irritations and inflammations.

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WOMEN *and* CHILDREN

always derive far-reaching benefits from

O'Sullivan's HEELS

WEARING HARD LEATHER HEELS means repeated jarring of the whole body, with constant irritation of the nervous system. The depression that naturally results is bound sooner or later to lower—in some degree—each individual's physical and mental efficiency.

WEARING O'SULLIVAN'S HEELS means a softened, shock-relieved step that not only avoids the nervous irritation inseparable from the use of leather heels, but proves a constant source of personal comfort and satisfaction—a logical aid to the conservation of nervous energy.

Medical men recognize that O'Sullivan's Heels have a definite health value.

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NEW YORK

GYNECOLOGY AND OBSTETRICS

DOCTOR'S NAME.	HOSPITAL.	DAY.	HOUR.	REMARKS.
LADINSKI, L. J.	Beth Israel Hospital, 70 Jefferson St.	Tues. & Fri.	2 P.M..	Gynecology.
LADINSKI, L. J.	N. Y. Polyclinic Hospital, 345 W. 50th St.	Monday	9 A.M..	Gynecology.
RONGY, A. J.	Lebanon Hospital, Westchester & Cauldwell Aves.	Tues. & Thurs.	9 A.M..	Gynecology and obstetrics.
RONGY, A. J.	Jewish Maternity Hospital, 270 E. Broadway	Daily	1 P.M..	Obstetrics.
SEELIGMAN, G.	German Hospital, Park Ave. & 77th St.	Tues. & Fri.	all day..	Feb. 1st to Aug. 1st.
SEELIGMAN, G.	Lebanon Hospital, Westchester & Cauldwell Aves.	Tues. & Thurs.		Oct. 1st to Feb. 1st.
TAYLOR, H. C.	Roosevelt Hospital, 59th St. & 9th Ave.	Mon., Tues., Wed., Thurs. & Fri. Saturday	8.30 A.M.. 2.30 P.M..	Gynecology. Gynecology.
VINEBERG, H. N.	Mt. Sinai Hospital, 100th St. & 5th Ave.	Tues. & Fri.	2 P.M..	Gynecology.
VINEBERG, H. N.	Mar Moriah Hospital, 138 E. 2d St.	Wed. & Sat.	2.30 P.M..	Gynecology.
WALDO, R.	Lebanon Hospital, Cauldwell & Westchester Aves.	Thursday	3 P.M..	Feb., Mar., Apr. & May, gynecology.
WIENER, SOL.	Mt. Sinai Hospital, 100th St. & 5th Ave.	Tues. & Fri.	2-6 P.M..	Gynecology.

GENITO URINARY

CARLETON, S.	Metropolitan Hospital, Blackwell's Island	Wednesday	2 P.M..	Clinics—and other days during week.
FULLER, EUGENE	New York City Hospital, Blackwell's Island	Wed. & Sat.	P.M..	.....
GREENE, R. H.	City Hospital, Blackwell's Island	Wednesday	2-4 P.M..	G. U. Surgery.
HAYDEN, J. R.	Bellevue Hospital, 1st Ave. & 26th St.	.....	.....	Any time, any day, as cases come in.
KEYES, E. L.	Bellevue Hospital, 1st Ave. & 26th St.	.....	.....	Any time, any day, as cases come in.
OSGOOD, A. T.	Bellevue Hospital, 1st Ave. & 26th St.	Thursday	Noon	G. U. Surgery.

ORTHOPEDIC SURGERY

BOGARDUS, H. J.	New York Orthopedic Hospital, 126 E. 59th St.	Tues., Wed. & Fri.	8.30 A.M..	.....
FARRELL, B. P.	New York Orthopedic Hospital, 126 E. 59th St.	Tues., Wed. & Fri.	8.30 A.M..	.....
HIBBS, R. A.	New York Orthopedic Hospital, 126 E. 59th St.	Tues., Wed. & Fri.	8 to 10.30 A.M..	.....

(List continued from November issue. See list each month.)

The Management of an Infant's Diet

In extreme emaciation, which is a characteristic symptom of conditions commonly known as

Malnutrition, Marasmus or Atrophy

it is difficult to give fat in sufficient amounts to satisfy the nutritive needs, therefore, it is necessary to meet this emergency by substituting some other energy-giving food element. Carbohydrates in the form of maltose and dextrins in the proportion that is found in

MELLIN'S FOOD

are especially adapted to the requirements, for such carbohydrates are readily assimilated and at once furnish heat and energy so greatly needed by these poorly nourished infants.

The method of preparing the diet and suggestions for meeting individual conditions sent to physicians upon request.

MELLIN'S FOOD COMPANY, BOSTON, MASS.

In Neurasthenic Conditions

Hysteria — Anxiety
Worry — Brain Fag
Insomnia — Overwork
Indigestion (Nervous)
Recovery from the after-effects of Colds, La Grippe, etc.
Alcoholic Excess
Rum Stomach

℞ **CELERINA**

Dose of Celerina: Teaspoonful three times a day before or after meals

Harrison Narcotic Law does not apply to Celerina

Efficient Mucous Astringents

Kennedy's Light Pinus Canadensis is labeled

ABICAN

(Kennedy's Light Pinus Canadensis)

AND

Kennedy's Dark Pinus Canadensis is labeled

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(Kennedy's Dark Pinus Canadensis)

To obviate confusion with any of the other **"Pinus Group"** and to more readily differentiate between the **Light** and **Dark** varieties of Kennedy's Pinus Canadensis, the changes as shown have been suggested.

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Surgical Technique: Instruction and Practice

AN ORIGINAL plan of teaching Surgical Technique, giving the instruction, and enabling the doctor to do the operations over and over, until he has mastered all details. Particular attention is given to the table toilet, and the work is performed as humanely as if the operations were being done upon an anaesthetized human. *The operations are all performed by the student.*

Each table is furnished with the same instruments that are to be found in any well-equipped operating room, and gowns and gloves are supplied to each student.

The Laboratory is open daily from 8:30 to 5 o'clock, which makes it possible for the man whose time away from his practice is limited, to get the work in the shortest possible time.

Special courses may be had in surgical anatomy on the cadaver.

Personal Instruction, Actual Practice, and Exceptional Equipment

See advertisement in January issue of this journal and detailed information regarding our Institution

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LISTERINE

An Unirritating Antiseptic Solution

LISTERINE provides a convenient and very satisfactory wet antiseptic dressing for accidental or operative wounds.

LISTERINE one part, water two or three parts, forms a trustworthy antiseptic solution for cleansing and dressing fresh wounds, cuts and abrasions.

LISTERINE solution is strictly unirritating and in no degree does it interefere with the reparative processes in progress in the wounded tissues.

LISTERINE is composed of eucalyptus and other essential oils which possess stimulating qualities, while its boric and benzoic ingredients add much permanency to its antiseptic and protecting influence.

LISTERINE dressings **permit** wounds to heal uninterruptedly — consequently, **rapidly,** and especially so when applied in a manner suggested by a Railway Surgeon of wide experience, in a paper entitled "Treatment of Hand Injuries" which will be mailed to surgeons upon request by

LAMBERT PHARMACAL COMPANY

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Valentine's Meat-Juice

In **Hospital** and **Private Practice** and **in their own persons** when ill, **Physicians** have demonstrated the **Power** of **Valentine's Meat-Juice** to **Sustain** and **Strengthen** the **Weakened Vital Forces** when the **Digestive Organs** are **Impaired**

Dr. Julian Calleja, *Pres. Royal Academy of Medicine of Madrid, Spain:* "I consider VALENTINE'S PREPARATION OF MEAT-JUICE to be of a very superior order for invigorating the nervous system, for which I use it myself and prescribe it to my patients."

John Tanner, M. D., LL. D., *Senior Physician Farringdon General Dispensary for Diseases of Women and Children, London, England:* "In cases of Flooding or Hemorrhage of any kind, Fevers, low forms of Pneumonia, Extreme Exhaustion when the stomach is too irritable to retain any ordinary preparation, then VALENTINE'S MEAT-JUICE will be found to be a perfect God-send."

VALENTINE'S PREPARATION
NUTRIO PRIME
MEAT JUICE.
The result of an original Process of Preparing Meat, and extracting its Juice by which the elements of nutrition are obtained in a state, ready for immediate absorption.
DIRECTIONS-Dissolve one teaspoonful of the Preparation in two or three tablespoonfuls of cold or warm water. The use of boiling water changes the character of the preparation.

For sale by American and European Chemists and Druggists.

VALENTINE'S MEAT-JUICE COMPANY,

RICHMOND, VIRGINIA, U. S. A.

V 7

Acne Rosacea

YEAST has long been known effective in diseases of the skin. In most instances, however, the treatment was carried out with some unusual form or special preparation of the product, secured with inconvenience if not difficulty, and of an unknown strength.

The report from Jefferson Medical College, of the recent yeast researches of Philip B. Hawk, Ph.D., and associated physicians, states that all tests were made with FLEISCHMANN'S COMPRESSED YEAST, which is a scientifically cultured yeast of the species Saccharomyces Cerevisiae and is of uniform strength.

Fleischmann's Compressed Yeast is most widely used because of its superiority in making bread; and the investigation conducted by Dr. Hawk unquestionably demonstrated its therapeutic value.

Eight cases were tested, of acne rosacea, with the result of improvement or cure in every case. In acne vulgaris, seventeen tests were made and all patients were improved or cured. Likewise, excellent results were noted in furunculosis and in gastro-intestinal diseases.

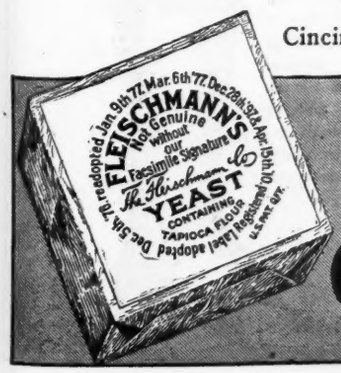
The dosage was usually one cake of yeast, three times daily, before or after meals, and was administered in a suspension of water, fruit juice or milk.

Fleischmann's Compressed Yeast may be secured fresh, daily, in most grocery stores. Or, write The Fleischmann Co. in the nearest large city, and it will be mailed direct on days wanted.

The report, giving the record of each case (Journal A. M. A. Vol. LXIX, No. 15), has been reprinted in convenient filing form and distributed to physicians. Additional copies obtainable on request.

The Fleischmann Company, New York

Cincinnati, Ohio Seattle, Wash. San Francisco, Cal.



Fleischmann's Compressed Yeast

A NEW MEDICAL DIRECTOR AT THE HOTEL CHAMBERLIN.

It is a pleasure to announce that Dr. Samuel G. Tracy, a well-known physio-therapeutist, will have entire charge of the Physio-Therapeutic Department at the Hotel Chamberlin, Fortress Monroe, Virginia.

Fortress Monroe is one ideal spot, and the Hotel Chamberlin under the management of George F. Adams, affords a place for recreation and rest that is second to no other resort upon this continent.

In addition to the ideal location of the hotel overlooking Hampton Roads, so famous in American history, it is equipped with the most complete outfit of electro and physio therapeutic appliances.

Dr. Tracy, who will act as director of this particular department, has given special attention to the study of electro and physio-therapeutics, and was for years a student of Rockwell and Morton.

Dr. Tracy was formerly associated with the Electro-Therapeutic Department of the New York Post Graduate Hospital Medical College and visited Nauheim for the purpose of making a special study of the Nauheim methods, and upon his return was medical director of the New York Nauheim Artificial Baths. We congratulate the Hotel Chamberlin in securing a medical director who is so well equipped by years of experience to accord the guests of this hotel his services as a specialist in nervous and chronic diseases, and in those conditions where elimination and reduction is so advisable by means of hydrotheopathy and electrotheopathy.

In view of the impossibility and the reluctance of forwarding to foreign spas, patients who require the treatment such as can be accorded at the Hotel Chamberlin, the medical profession will no doubt be glad to learn that this famous resort offers the necessary facilities and the advantages of foreign resorts without the danger of travel and distance to be traversed.

INTERMITTENT HEART.

Polk has used Cactina Pillets with excellent success in intermittent heart. One or two Pillets every two or three hours quickly restores the heart's rhythm.

"DEPENDABLE HEART TONIC."

Cactina Pillets is the most dependable functional heart tonic in use, according to Griffin. One or two pillets three or four times a day are very effective.

The Winkley Artificial Limb Co.

Largest Manufactory of Artificial Legs in the World

Manufacturers of the Latest Improved Patent Adjustable Double Slip Socket

Artificial Leg

With Sponge Rubber, Mexican Felt or English Willow Foot

Warranted Not to Chafe the Stump

PERFECT FIT GUARANTEED

From Casts and Measurements Without Leaving Home

Thousands of our Slip Socket Legs now being worn. U. S. Government Manufacturers.

☞ **This is the leg that is being recommended and ordered by so many of the leading physicians and surgeons.**

Send for our Large New Illustrated Catalog

This cut shows leg for amputation six inches below the knee with inside socket thrown out of its proper position in order to show its construction.

MINNEAPOLIS, MINN. :: U. S. A.

Coffee Drinking Dissipates Energy

Any article of diet taken into the system which acts as a "whip" to flagging energy is but temporary in its ***apparent*** benefit. In the end, it ***subtracts*** from the ***total energy*** of the individual. This, in the case of Coffee, is a manifestation of the law of alkaloidal "action and reaction," caffein being the alkaloid in coffee.

The temporary ***feeling*** of increased energy, after having taken the usual cup or two of coffee is, in a large majority of individual cases, soon followed by a feeling of lassitude which more than counter-balances the temporary "spurt" of ***artificially*** aroused activity of mind or body. Hence, we may truthfully affirm that, in summing up its effect, coffee-drinking dissipates energy.

On the other hand—

POSTUM

—a most agreeable beverage—can in no manner delude the user, because its effect is simply and directly to increase warmth and add a little ***real*** nourishment.

In those individual patients where caffein is particularly irritating (and they are legion) the Physician can find ready and efficient help in recommending Postum.

Postum comes in two forms: Postum Cereal, which requires boiling to bring out its rich flavor, and Instant Postum, which is soluble—made in the cup instantly by adding hot water. Both forms are equally delicious and wholesome. The cost per cup is about the same.

Samples of **Instant Postum, Grape-Nuts** and **Post Toasties** for personal or clinical examination, will be sent on request to any Physician who has not yet received them.

Postum Cereal Company, Battle Creek, Mich., U. S. A.

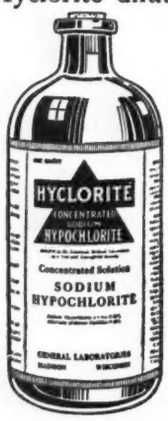
HYCLORITE
CONCENTRATED SODIUM HYPOCHLORITE

HYCLORITE

Concentrated Sodium Hypochlorite

In Empyema

Surgeons report that empyema cases after lobar pneumonia clean up with remarkable rapidity under treatment of irrigation with 1:1000 Hyclorite dilution. They are especially pleased with the complete absence of irritation.



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Hyclorite is prepared to a definite hypochlorite strength and alkalinity.

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There is no waste, testing, or waiting in making a Dakin's solution from Hyclorite.

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MANY PHYSICIANS AND HOSPITALS NOW USING A TISSUE GAUZE.

SAVES COTTON NET AND HAS REMARKABLE ABSORBENCY SPEED.

The technical department of a paper manufactory has developed a new gauze which has decided economical advantages, particularly in surgical work.

This gauze being a tissue, scientifically made from selected wood pulp, is less expensive than cotton net. Through skill in manufacturing, it has an absorbency speed rated in a good many tests at three times that of other porous materials.

"Zorbik," as the new tissue is called, feels soft and fine. It is free from injurious matter and its physical properties are not affected in any way by sterilization. Repeated tests show that it is as soft after sterilization as before and does not disintegrate in the process.

It is easy to see that a suitable tissue gauze which has the remarkable powers of absorbency that have been demonstrated in Zorbik, would prove of considerable value for quick drainings. Physicians and nurses, have made some notable uses of Zorbik in dressings of this nature. In a case at the Crozer Hospital, Chester, Pa., which involved abdominal abscess following operation for appendicitis, the

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Will abort Colds, Grippe, Influenza and Pneumonia.

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Influenza B. strains from present epidemic and others	200,000,000
Streptococci, many haemolytic and other types	100,000,000
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This Vaccine is also used with success in the prophylaxis of these diseases.

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Puffed Grains are made by Prof. Anderson's process—by being shot from guns.

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When the guns are shot the steam explodes. Over 100 million separate explosions occur in every kernel. The grains are puffed in this way to eight times normal size.

The object of all cooking is to break the food cells, to facilitate digestion. But rarely does cooking break even half of them. Our puffing process breaks them all. So Puffed Grains are the best-cooked cereals in existence.

Puffed Wheat and Puffed Rice are whole grains. Corn Puffs are pellets of hominy puffed. All go through this steam-exploding process.

They place three grains at your command, better fitted for digestion than they ever were before.

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Sole Makers

Puffed Rice
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All Steam-Exploded Grains

(2018)

new tissue was used very effectively as a dry dressing, although the wound had discharged freely.

The method of using Zorbik in such cases is first to cover the wound with a thin layer of net gauze and then pack Zorbik over the gauze so that it will have an opportunity to absorb and hold moisture in great quantities if need be.

The economy of such a tissue can also be carried to the maternity ward, where it is used very practically for pads, drains and dressings to replace gauze and cotton.

In a good many hospitals, it has already been found of value for tampons or mops for mopping wounds. Cutting it with scissors serves to seal the edges, making a successful and inexpensive tampon. Nurses report that the tissue also may be used advantageously for diaper pads.

In view of the increased costs of cotton dressings and the greater absorbency of Zorbik, it seems to be growing rapidly in favor and has already been given wide use by physicians and hospitals in various parts of the country.

GRIPPAL PAINS.

Probably the most distressing symptom of an influenza attack is the severe and often excruciating pain in the back and limbs. Although there are various internal remedies for its relief, the effect is not always as rapid as the patient desires. In these cases it has been found that the local application of Baume Analgesique Bengue causes a speedy amelioration of the patient's suffering, and if its use in continued in connection with internal medication, a much more satisfactory effect on the systemic condition is produced.

As is well known this preparation has gained an enviable reputation in the treatment of neuralgias of various kinds, and its association with internal analgesic remedies is, therefore, a very logical and advantageous procedure in cases of grippal pain.

In this connection attention is called to the announcement on page .... in which the profession is notified of the discontinuance of samples of Baume Analgesique Bengue. This has been occasioned by the request of the Government to pharmaceutical firms to exercise all possible economy in the use of important drugs and chemicals. Although until the close of the war, therefore, there will be no further distribution of the well known "triplet" samples of Baume Analgesique Bengue, the physicians of the country are assured that there is an adequate supply to insure prompt filling of their prescriptions and to meet all professional requirements.

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A remarkably potent and efficient

GERMICIDE, ANTISEPTIC and DISINFECTANT

In introducing **Woolf's Solution of HYPOZONE** to the profession, we do so with every confidence. The clinical tests it has undergone have been so thorough, and the results so entirely satisfactory, that there is no fear of a contradiction of the statement that this is *the most efficient and staple hypochlorite solution before the profession at this time.*

The objections which physicians have found in other preparations of the hypochlorites are overcome in **Woolf's Solution of HYPOZONE**, which is easily prepared, harmless in any dilution, exceedingly efficient in all proper indications, very stable, and moderate in price. *It is alkaline in reaction, non-irritating and non-toxic.* It is employed successfully in

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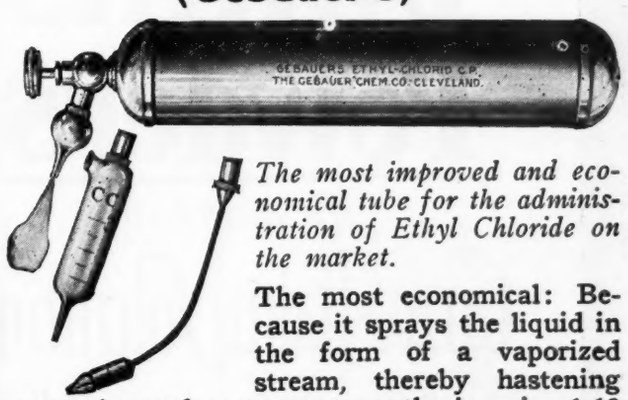

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40 gram tube with ordinary spraying nozzle	$1.10
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An operation is successful only when the patient has made a perfect recovery.

In many cases, where operations would have been eminently successful the recovery of the patient has been hindered by the ill effects of an ether containing impurities.

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is prepared by a newly patented process of purification that eliminates every impurity. With a boiling point of 34° to 36° centigrade and a specific gravity of .709 to .710 at 25° centigrade; with no trace of residue or evaporation and negative to tests for impurities, ALBANY ETHER, Pro Narcosi demands the attention of every surgeon whose goal of treatment is perfect recovery.

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It is an easy matter to employ one of the many dusting or dressing powders offered to the medical profession as being the best for the treatment of minor wounds, abrasions, chafe, and irritation or inflammation of the skin surface.

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Kora-Konia has been steadily gaining in use among the best class of physicians, because it meets every indication for dusting or dressing powder, and because its combination has been carefully evolved, and in its manufacture only the best quality of material and the highest skill in compounding are employed.

Kora-Konia is not in any sense at all a preparation intended simply for toilet use. It was designed especially for professional use by physicians and nurses, and it is being used by numbers of these with perfect satisfaction.

Any physician who is not acquainted with Kora-Konia, or who has not yet tested it clinically, will find it for his own interest as well as for the interests of his patients, to become acquainted with this agent which is supplied by: Gerhard Mennen Chemical Co., Newark, N. J.

WOMEN IN THE WORLD'S PROGRESS.

In this day when women's work is so important in keeping the wheels of the world's progress moving, their physical condition should be conserved in every way, whether it be in the home, in commercial offices or in the hospital as a nurse, but unfortunately much time is lost through menstrual irregularities and much suffering incident to the pain thereto.

Dysmenorrhea is possibly the most frequent cause for the loss of time and in mitigating this condition, not alone is the conservation of time an item, but the relief from pain is a humanitarian act.

In the treatment of Dysmenorrhea, Hayden's Viburnum Compound will add many hours and days of comfort each month to the lives of the sufferers. Its universal adoption and recognition by the profession was established upon the satisfactory results which it renders in Dysmenorrhea.

Given in two teaspoonful doses administered in hot water will afford relief from pain. It contains no narcotics, nor habit forming drugs, and if you are not familiar with its efficiency, a request to the New York Pharmaceutical Company, Bedford

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The large package makes one gallon
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No bother fuss or worry. Simply add water, filter and you have a neutral solution of the required strength of Sodium Hypochlorite. May we submit literature?

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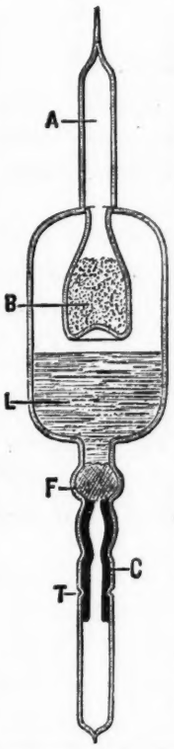

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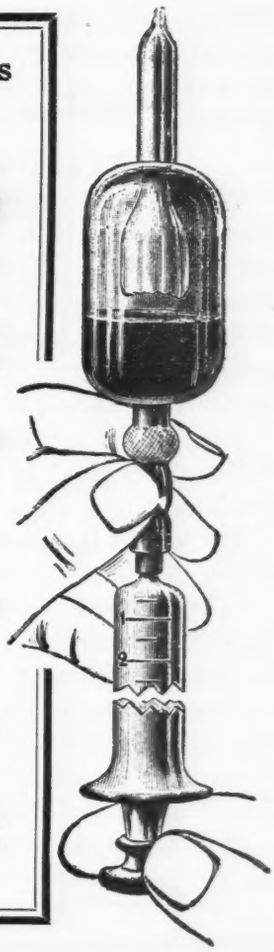

Springs, Bedford, Mass., will bring you samples for clinical demonstration and a brochure giving formula and many suggestive thoughts in the use of this product.

ATTRACTIVE LITERATURE.

We are again in receipt of a piece of attractive literature from Messrs. Reed & Carnrick, of Jersey City, N. J. This brochure is entitled "The Modern Therapy of Renal Disorders," and in addition to a large amount of very valuable and suggestive points given, it is illuminated by five reproductions of early paintings.

The first by Jan Steen painted between 1626 and 1679, the original in the State Museum in Amsterdam.

The second is "The Obstetrician," a painting depicting the birth of Henry the Fourth.

"The Surgeon" is represented by the work of Cornelius Dusart, and clearly depicts the terror of the patient prior to the anesthetic period.

"The Ophthalmologist" is appealed to by an illustration taken from von Bartisch's work in 1686, illustrating an ophthalmological operation as conducted under that date.

"The Urologist" is accorded a place by the painting by Van Ostade. Altogether this is a very attractive brochure and quite in keeping with other pieces of literature issued by this well known firm.

We presume that Messrs. Reed & Carnrick would be glad to send a copy of this book to any of our readers upon request.

SOMETHING DIFFERENT.

The physician who employs Alkalol cannot fail to recognize, as well as appreciate, that it acts differently from what are generally referred to as antiseptic solutions.

Alkalol is hypnotic, which means that it is thus able to pass into impoverished or depleted cells, those physiological elements in the form of mineral salts, which are necessary to maintain the integrity and activity of cell secretions.

Alkalol rapidly demonstrates its efficiency in cystitis, urethritis, and vaginitis when employed as an injection or irrigating fluid. Alkalol makes an ideal application on tampon in cervical ulceration or erosion.

Akalol is efficient when used as a wet dressing for hemorrhoids, balanitis, herpes, genitalis, etc.

Interesting literature explaining the composition, mode of action and indication for the use of Alkalol will be sent gratis to physicians on request by the Alkalol Company, Taunton, Mass.

WHAT TO DO IN PHIMOSIS

In a report which has been made on the treatment of Phimosis, occurs the following passages.

> "Phimosis in the practice among children, is one of the most frequent conditions requiring attention; health and growth depending upon relief of pressure and consequent irritation.
>
> "Reduction of phimosis by retraction under LYSOL and glycerine, 1 part of the former and 20 parts of glycerine, is harmless, practically painless and bloodless."

We will gladly send this report and a trial bottle of LYSOL.

So that we can keep LYSOL sample bottles out of the hands of irresponsible parties, and so protect the medical profession, we ask, in every case, that you accompany your request with your professional card or letter head.

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Influenza, Bronchitis and Pneumonia

are sure to continue to be more or less prevalent during the coming months. Thus, for a long time, lapses in hygiene or personal prophylaxis will mean the possibility of these diseases developing in the susceptible. Influenza does not need to be raging as it has been, to be a constant source of danger to those predisposed by age or circumstance. In 1916, even when it was not epidemic, Influenza caused over 18,500 deaths!

The importance, therefore, of maintaining an effectual line of defense against bacterial infection cannot be exaggerated. With the chief salient in our hygienic "front" so evidently the nose, mouth and throat, it is clear that these parts must be effectively guarded.

Fortunately, this is not difficult, for in DIOXOGEN, medical men have a dependable means of defense that is especially qualified to keep the upper air passages free from infectious organisms.

Pure, non-irritating, non-toxic, tasteless, colorless, and yet more potent in germ-killing power than the usually employed carbolic or bichloride solutions, DIOXOGEN has proven itself the safest and most serviceable germicide for all hygienic purposes.

The place DIOXOGEN fills in countless homes, and its widespread use by physicians in combating infection is due to professional recognition of the safety and efficiency of this non-toxic germicide.

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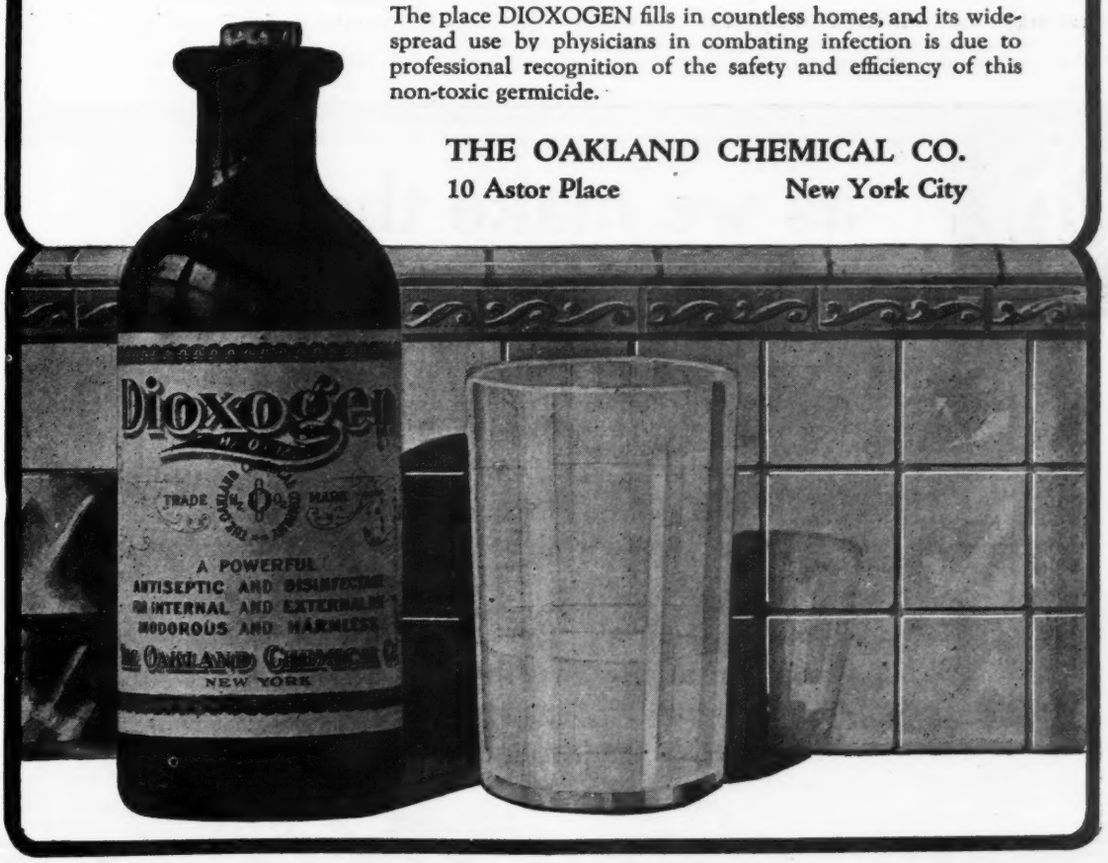

In the book: "The Crowd, A Study of the Popular Mind" (LeBon), there is related the story of a shipwrecked crew on a raft, watching eagerly for some sign of a rescuing vessel. After some days of the great physical discomfort and mental anxiety imposed by their condition, one of the men saw on the horizon what he declared was a sail. His companions saw it too, and because they wanted very much that it should be a sail, and because of the poignant hope in their breasts that it might be one, they came to think as did the first observer, that it really was one. And then when they came to it, they found it only a tree which has been uprooted in the storm.

There have been frequent occasions in the history of medicine and pharmacy when much heralded new remedies or so-called specifics proved to be "trees" rather than the hoped for "sails."

But interesting as is this phase of the psychology of the delusions of the popular mind, more interesting are the phychial processes of those who, in spite of absolute proof of the existence of a thing or the value of some scientific principle or theory, refuse to accept a "sail" as a "sail" or accept it so grudgingly and use it, or permit its use so sparingly or half-heartedly that the good results possible from its application are never fully realized.

For instance, the value of diphtheria antitoxin at this time is no longer questioned by scientific men and by most of the laity. The mortality rate from diphtheria has been cut in two by its use in the last quarter of a century, and yet, statistics obtained from the registration area for the past few years show that the yearly mortality in this country from diphtheria is more than 23,000. There can be no doubt that such a high mortality rate is due in large part to antitoxin not being administered at all because of opposition to its use or objection to the cost, to its too conservative use as concerns dosage and method of administration and the fear of serum sickness, etc., or to its being injected too late to successfully check the disease process.

There are still some prejudices to be overcome and some old ideas and conceptions to be discarded if diphtheria antitoxin is to come into its rightful place as a life saver. The specification by physicians and druggists for high grade, concentrated, purified antitoxin (Eli Iilly Company, Indianapolis, Ind.), packaged to meet dosage requirements and all methods of administra-

as we make them

—speaking now of our Aseptic Ampules:—

(*a*) we thoroughly sterilize the glass ampule bulbs;

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(*d*) we fill these sterilized ampule bulbs with these sterilized solutions in an aseptic environment, seal the tube ends, label each ampule so that it can be carried singly if desired, and pack in cartons of 6 or 12.

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and assures same a kindly reception by the stomach.

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SAMPLES ON APPLICATION MELLIER DRUG COMPANY, St. Louis

tion and at such prices as make its administration possible in even the poorest cases will in a great measure assist in this readjustment.

A SUGGESTION FOR SPANISH INFLUENZA

In view of success obtained by Woolley, at Camp Greene, and by McCord, Friedlancer and Walker at Camp Sherman, in preventing diseases of the upper respiratory tract, such as meningitis, measles, pneumonia and diphtheria, by local use of Chlorazene and Dichloramine-T solutions, it is reasonable to believe that equally good results can be obtained with the same remedies in the prevention and cure of Spanish Influenza.

The method employed at Camp Green was to gargle or spray the throat three or four times daily with 0.25 percent solutions of Chlorazene. The nasal pharyngeal tract was then sprayed twice a day, or more frequently, with 2 percent Dichloramine-T solution in Chlorcosane.

This treatment, in association with aspirin and other salicylates, and the generous use of bacterins, has much promise.

Chlorazene, Dichloramine-T and Chlorcosane are obtainable from The Abbott Laboratories, Chicago, Ill., which is supplying thousands of pounds of these products to the United States Army and Navy.

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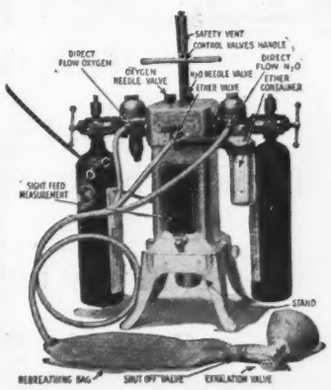

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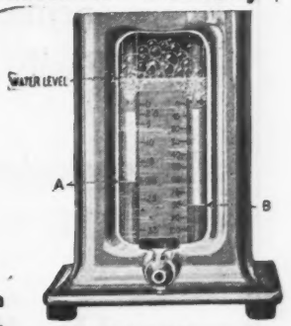

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VACCINE TREATMENT OF HAY FEVER.

By G. H. Sherman, M.D., Detroit, Mich.

It will not be long until hay fever victims will again seek relief from their suffering. Unfortunately, the endless variety of drugs and local treatments that have been applied for this ailment have been so unsatisfactory that most hay fever victims have abandoned consulting doctors and simply tolerate the disease as best they can until the season is over with. This does not apply, however, to those who have given the vaccine treatment a trial. Hay fever victims find that this treatment either prevents or aborts the attack or gives such relief that they come back for the same treatment when the season approaches.

The writer has made some special efforts to obtain reliable information concerning the comparative virtues of pollen and bacterial vaccines in the treatment of hay fever and has found that bacterial vaccines give by far the best results. This shows that pollen irritation is not the only etiologic factor in hay fever and that irritation from pathogenic organisms also plays an important part in the disease. In fact, are common in irritated tissues, no difference what the source of the irritation is and, consequently, aggravate and prolong the irritation. That is what undoubtedly happens in hay fever.

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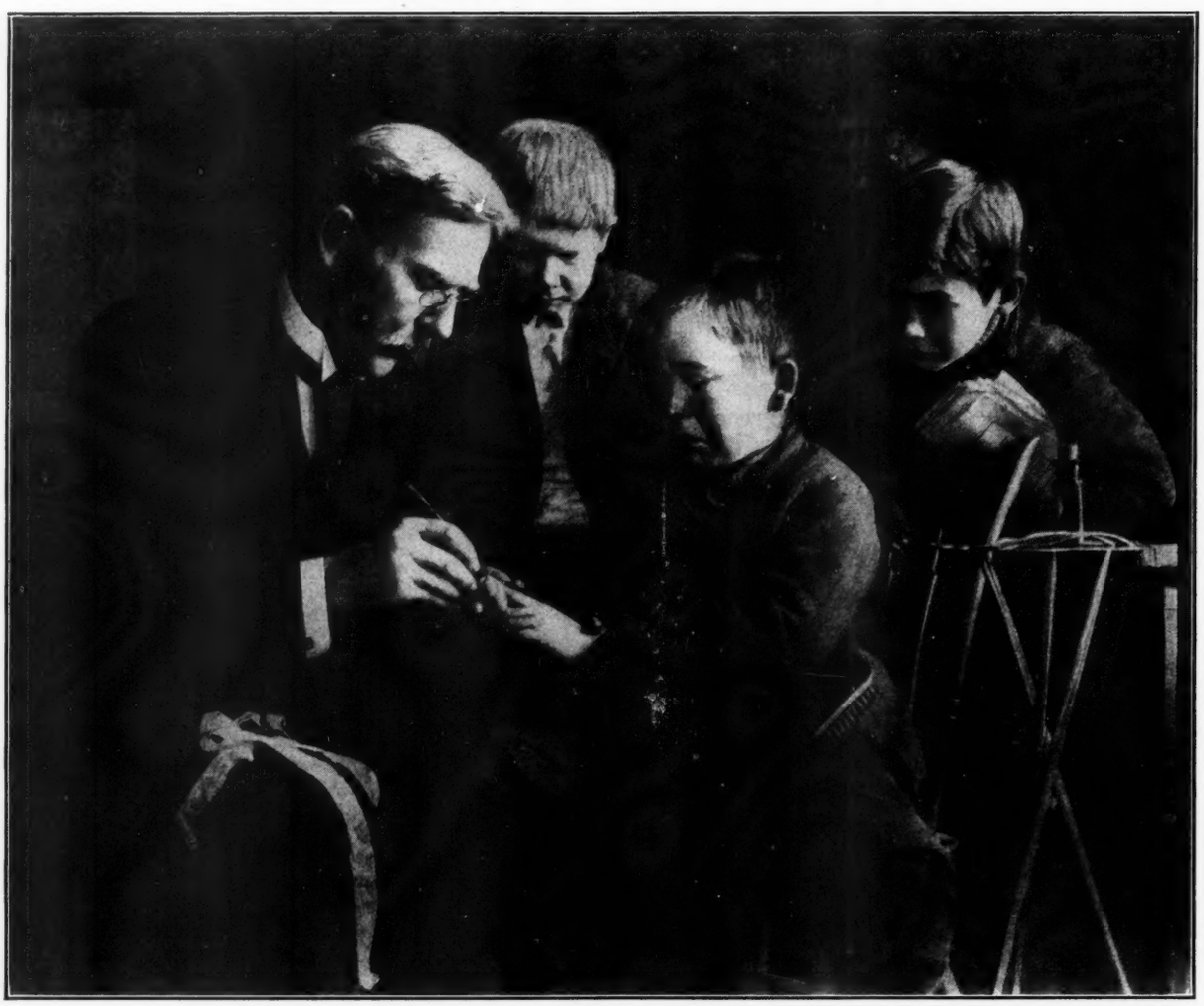

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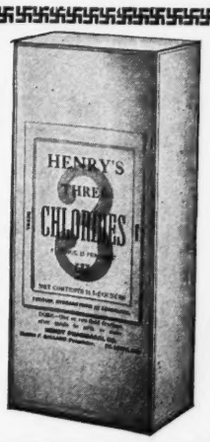

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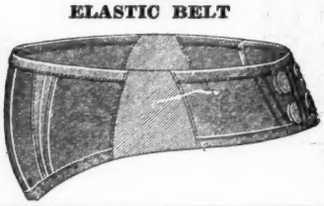

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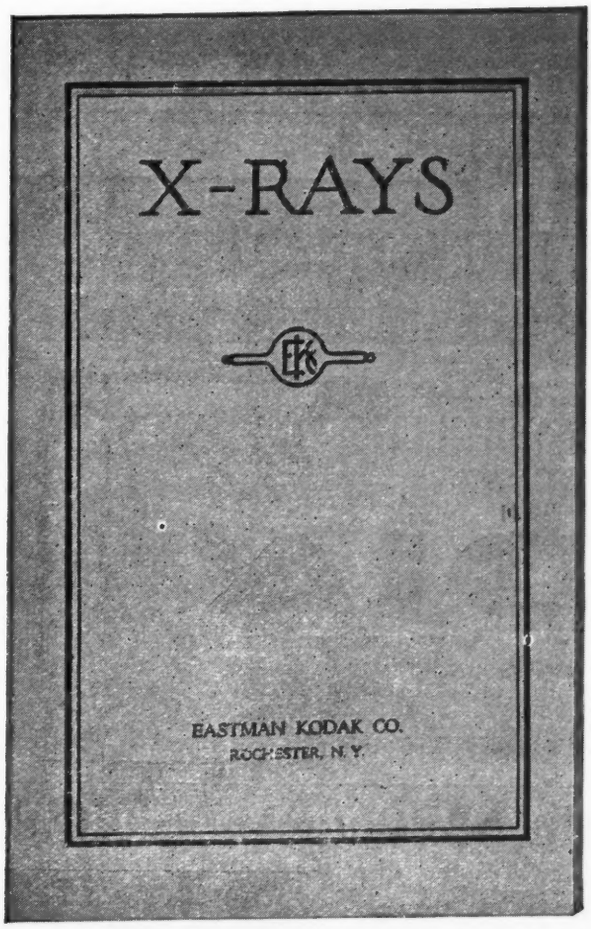

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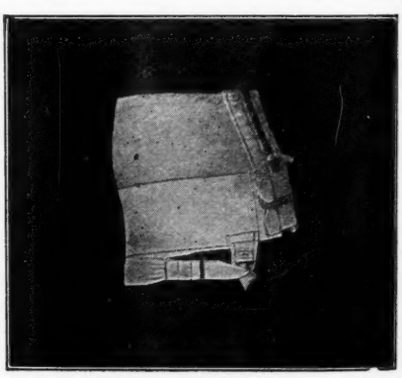

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